MODEL

HG-10B Amateur VFO

HEATHKIT®

ASSEMBLY MANUAL

HEATH COMPANY • BENTON HARBOR, MICHIGAN

HEATHKIT®

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595-886-05

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Kit orders and delivery information	(616) 982-3411
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YOUR HEATHKIT 90-DAY FULL WARRANTY

During your first ninety (90) days of ownership, Heath Company will replace or repair free of charge — as soon as practical — any parts which are defective, either in materials or workmanship. You can obtain parts directly from Heath Company by writing us or telephoning us at (616) 982-3571. And we'll pay shipping charges to get those parts to you — anywhere in the world.

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You will receive free consultation on any problem you might encounter in the assembly or use of your Heathkit product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

Our warranty, both express and implied, does not cover damage caused by use of corrosive solder, defective tools, incorrect assembly, misuse, fire, customer-made modifications, flood or acts of God, nor does it include re-imbursement for customer assembly or set-up time. The warranty covers only Heath products and is not extended to non-Heath allied equipment or components used in conjunction with our products or uses of our products for purposes other than as advertised.

And if you are dissatisfied with our service — warranty or otherwise — or our products, write directly to our Director of Customer Services, Heath Company, Benton Harbor, Michigan, 49022. Telephone (616) 982-3524. He'll make certain your problems receive immediate, personal attention.

HEATH COMPANY
BENTON HARBOR, MI. 49022

Prices and specifications subject to change without notice.

Assembly and Operation of the

HEATHKIT

AMATEUR VFO

MODEL HG-10B

HEATH COMPANY
BENTON HARBOR,
MICHIGAN 49022

TABLE OF CONTENTS

Specifications	2
Introduction	3
Circuit Description	3
Construction Notes	5
Schematic	5*
Parts List	6
Proper Soldering Techniques	8
Step-By-Step Procedure	9
Step-By-Step Assembly	10
Dial Mechanism	10
Chassis Parts Mounting	14
Chassis Wiring	16
Chassis-To-Dial Mechanism Assembly	18
General Wiring	20
Pilot Lamp Wiring	22
Final Chassis Assembly And Wiring	22
Dial Drive Assembly	24
Final Assembly	26
Installation	27
VFO Calibration	29
Operation	32
In Case Of Difficulty	33
Troubleshooting Chart	33
Replacement Parts Price List	36
Warranty	Inside front cover
Customer Service	Inside rear cover

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The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

SPECIFICATIONS

Band Coverage. . . . . .

Band (Meters)	Dial Calibration (mc)	Output Frequency (mc)
80	3.5 to 4	3.5 to 4
40	7 to 7.4	7 to 7.425
20	14 to 14.8	7 to 7.425
15	21 to 22.2	7 to 7.425
10	28 to 29.7	7 to 7.425
6	50 to 54	8.333 to 9
2	144 to 148	8 to 8.222

Load Impedance. . . . . 50,000 Ω or more.

Output Voltage. . . . . 5 volts rms, open circuit.

Output Connector. . . . . Phono-type socket.

Controls. . . . . FUNCTION switch (STBY-OPR-SPOT).
FREQUENCY (variable capacitor).
BAND switch.

Tube Complement. . . . . 1 - 6CH8, Oscillator-Cathode follower.
1 - OB2, Voltage regulator.

Power Requirements. . . . . 108 volts DC at 25 milliamperes and 6.3 volts AC or DC at 0.75 ampere. (These voltages are provided directly from the accessory socket of the Heathkit DX-60A, the DX-60B, and the DX-40 Transmitters, or the HW-16 Transceiver; a minor circuit change in the VFO is required for the DX-40.

Dimensions. . . . . 9-3/8" wide x 6-1/2" high x 9-1/8" deep.

Net Weight. . . . . 9-1/2 lbs.

INTRODUCTION

The Model HG-10B VFO represents the latest design techniques, providing maximum stability with accuracy and dependability.

A cathode follower stage is used for isolation between the series-tuned Clapp oscillator and the transmitter. The temperature-compensated components in the oscillator circuit, along with regulated B+ voltage, provide stable, drift-free operation.

Seven bands, 80 through 2 meters, are covered, each with a separate dial scale. The continuously variable, vernier tuning (28:1 ratio) permits tuning within each band quickly and accurately. Multiples of the VFO output frequency are used on 20 through 2 meters; on 80 and 40 meters, the output frequency is used directly.

The VFO is compatible with many amateur transmitters capable of providing operating voltages and having a VFO input. It is styled to match the Heathkit DX-60B transmitter. Electrically, it mates with the DX-60 series Transmitters or the HW-16 Transceiver, which will provide the necessary operating voltages and grid block keying for the VFO with no circuit changes. Also, the Heathkit DX-40 Transmitter can be used with the VFO after only minor wiring changes. The VFO can be modified easily to provide cathode keying to match the DX-40.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

CIRCUIT DESCRIPTION

The VFO circuit consists basically of three sections: the oscillator stage with its switch-selected, frequency-determining components; the cathode follower output stage; and the voltage regulator stage. Each of these sections will be discussed separately. Keying and use of the FUNCTION switch will also be described. While reading this description, refer to the Schematic Diagram to identify the circuit components that are mentioned.

OSCILLATOR

The pentode tube section V1A operates in a series-tuned Clapp oscillator circuit. The series-connected coil and variable capacitor selected with the BAND switch are placed in parallel with the four capacitors at the control grid of V1A. The result is a parallel-tuned circuit that determines the frequency of oscillation. The various fixed and trimmer capacitors selected with the BAND switch determine the frequency limits, or bandspread, of each band. Small compensating capacitors are selected to minimize frequency drift due to temperature changes. Note from the Schematic Diagram that the same frequency-determining components are used on 40, 20, 15, and 10 meters. On 80, 6, and 2 meters, individual tuned circuit components are selected with the BAND switch.

Feedback to sustain oscillation is obtained by connecting the cathode to the junction of the four capacitors at the control grid of V1A. A path to ground is formed by resistors R8 and R9 to provide a grid leak to maintain a negative voltage on the grid. The direct current path to ground from the cathode is through choke RFC2, resistor R2, the FUNCTION switch, and the KEY jack. RFC2 maintains the cathode of V1A above ground for the radio frequency currents.

The oscillator signal from the screen passes through the suppressor grid to the untuned plate of V1A by so-called electron coupling. This signal is then applied through capacitor C27 to the grid of triode cathode follower V1B.

CATHODE FOLLOWER

The basic purpose of triode tube section V1B is to provide isolation between the oscillator and the load. The signal is applied to the grid of V1B. The output of V1B is coupled (from the cathode) through capacitor C30 to the RF output jack. Resistor R5 in the cathode circuit of V1B establishes the output impedance of the VFO; resistor R6 provides the necessary operating bias.

VOLTAGE REGULATOR

Voltage for the plates and screen grid of tube V1 is applied through series dropping resistor R11 to voltage regulator (VR) tube V2. The characteristics of this tube are such that the current through it will vary to maintain a constant voltage drop across the tube. The DC voltage at the plate of the VR tube, therefore, remains constant, regardless of fluctuations in the applied B+ voltage. Regulated DC voltage from V2 is applied as B+ to V1A and V1B. The use of regulated B+ voltage is essential to the stable operation of oscillator stage V1A. Resistor R11 must be changed in value to compensate for different values of applied B+ voltage. This change is covered under Installation, with Figure 2 to obtain correct values.

Filament, B+, and grid block keying voltages for the VFO are obtained through the 4-conductor power cable from the associated transmitter. The fourth wire of the power cable is a ground connection between the VFO and transmitter ground circuits.

KEYING

For grid block keying, a keyed, negative DC voltage is applied from the transmitter, through the VFO power cable, to the neon lamp in the VFO. This DC voltage causes the neon lamp to conduct, allowing the negative voltage to be applied through R8 and R10 to the control grid of oscillator tube V1A. As a result, this keyed negative voltage turns the oscillator off and on. NOTE: The Heathkit DX-60 series Transmitters, or the HW-16 Transceiver, will provide the necessary grid block keying voltage for the VFO.

For cathode keying, it may be necessary to remove the jumper wire from across the key jack of the VFO and to make the keying connection from the transmitter to the VFO power cable. These two circuit changes are shown on the Schematic Diagram and will be described in the Installation section of the manual. When the key used with the transmitter is closed, a low-resistance ground path is provided for the cathode of oscillator stage V1A in the VFO. This ground path is through RFC2, R2, the FUNCTION switch, the key connection of the power cable, and finally through the closed key. As just described, closing the key provides a low-resistance ground path for the cathode of V1A, turning the oscillator on. With the key open, the cathode ground path is through resistor R9. The value of R9 represents a high-impedance ground path, preventing the oscillator from operating.

FUNCTION SWITCH

This switch has three positions which provide the following functions:

STBY (Standby): In this position, the cathode of the oscillator tube is not connected to ground through a low-resistance path and the oscillator is not operating.

OPR (Operate): With the VFO wired for grid block keying, the OPR position of the FUNCTION switch provides a low-resistance ground path for the cathode of the oscillator tube, turning on the oscillator. Grid block keying voltage is applied to the grid of the oscillator tube.

With the VFO wired for cathode keying, the cathode of the oscillator tube is connected to the key jack of the transmitter for keying, and the grid block keying circuit is disconnected and not used.

SPOT: The SPOT position of the FUNCTION switch connects the cathode of the oscillator tube to ground and opens the grid block keying circuit, turning on the oscillator, regardless of whether the VFO is wired for grid block or cathode keying.

CONSTRUCTION NOTES

This manual is supplied to assist you in every way to complete your kit with the least possible chance for error. The arrangement shown is the result of extensive experimentation and trial. If followed carefully, the result will be a stable instrument, operating with a high degree of dependability. We suggest that you retain the manual in your files for future reference, both in the use of the instrument and for its maintenance.

UNPACK THE KIT CAREFULLY AND CHECK EACH PART AGAINST THE PARTS LIST. In so doing, you will become acquainted with the parts. Refer to the charts and other information on the inside covers of the manual to help you identify the components. If some shortage or parts damage is found in checking the Parts List, please read the Replacement section and supply the information called for therein.

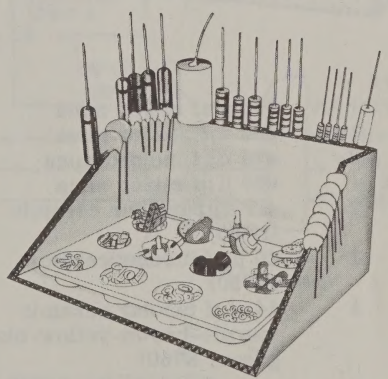
Resistors generally have a tolerance rating of 10% unless otherwise stated in the Parts List. Tolerances on capacitors are generally even greater. Limits of +100% and -20% are common for electrolytic capacitors.

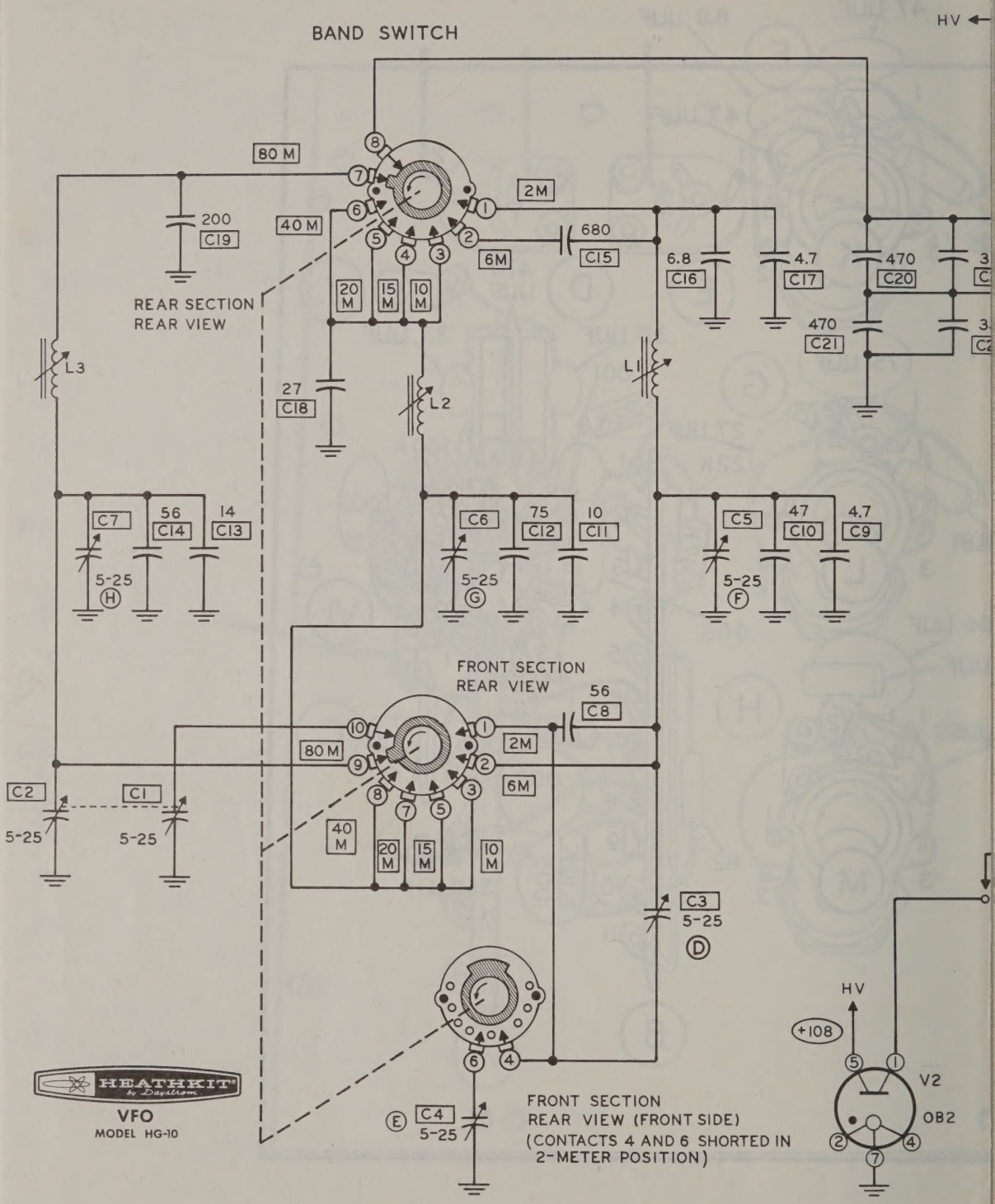
We suggest that you do the following before work is started:

1. Lay out all parts so that they are readily available.

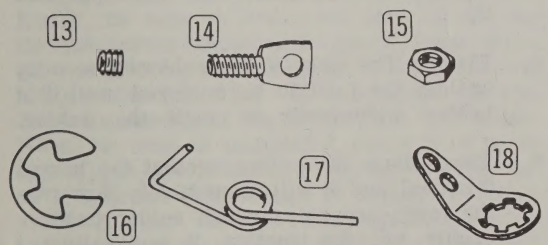
2. Provide yourself with good quality tools. Basic tool requirements consist of a screwdriver with a 1/4" blade; a small screwdriver with a 1/8" blade; long-nose pliers; wire cutters, preferably separate diagonal cutters; a pen knife or a tool for stripping insulation from wires; a soldering iron (or gun) and rosin core solder. A set of nut drivers and a nut starter, while not necessary, will aid extensively in construction of the kit.

Most kit builders find it helpful to separate the various parts into convenient categories. Muffin tins or molded egg cartons make convenient trays for small parts. Resistors and capacitors may be placed with their lead ends inserted in the edge of a piece of corrugated cardboard until they are needed. Values can be written on the cardboard next to each component. The illustration shows one method that may be used.




BAND SWITCH
HV
80 M
2M
40 M
6M
20 M
15 M
10 M
200
C19
680
C15
6.8
C16
4.7
C17
470
C20
470
C21
REAR SECTION
REAR VIEW
L3
L1
L2
27
C18
C7
56
C14
14
C13
5-25
H
C6
75
C12
10
C11
5-25
G
C5
47
C10
4.7
C9
5-25
F
FRONT SECTION
REAR VIEW
56
C8
C2
C1
5-25
5-25
C3
5-25
D
C4
5-25
E
HV
+108
V2
OB2
HEATHKIT
by Daystrom
VFO
MODEL HG-10
FRONT SECTION
REAR VIEW (FRONT SIDE)
(CONTACTS 4 AND 6 SHORTED IN
2-METER POSITION)

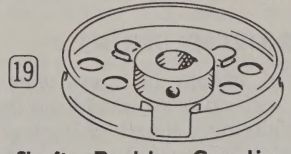
PART No.	PARTS Per Kit	DESCRIPTION
Hardware (cont'd.)		
[13] 250-33	2	6-32 x 1/8" setscrew
250-43	7	8-32 x 1/4" setscrew, slotted head
250-1193	1	8-32 x 3/8" setscrew
[14] 251-1	2	6-32 spade bolt
[15] 252-1	16	3-48 nut
252-40	3	5-40 nut
252-3	48	6-32 nut
252-7	11	Control nut
253-10	5	Control flat washer
[16] 253-11	1	E washer
253-36	2	Spring washer
253-39	1	9/16" OD flat washer
253-42	4	1/2" OD flat washer
254-7	19	#3 lockwasher
254-1	62	#6 lockwasher
254-4	9	Control lockwasher
255-13	1	1/4" spacer
255-16	2	1-1/4" spacer (shouldered)
255-17	4	1/2" spacer (shouldered)
258-1	2	Dial cord spring
[17] 258-25	1	Gear tension spring
[18] 259-1	2	Large #6 solder lug
259-6	1	Small #6 solder lug
259-10	1	3/8" control solder lug
259-12	3	1/4" solder lug



Terminal Strips-Sockets-Plugs

431-46	1	2-lug terminal strip
431-10	1	3-lug terminal strip
431-45	1	6-lug terminal strip
431-49	1	11-lug terminal strip
434-34	1	7-pin tube socket
434-75	1	9-pin tube socket
434-42	1	Phono socket
434-88	2	Pilot lamp socket
436-4	1	Phone jack (Key)
438-4	2	Phono plug
438-6	1	Octal plug
440-1	1	Octal plug cap

PART No.	PARTS Per Kit	DESCRIPTION
Wire		
340-2	1	Length #20 bare wire (small)
340-3	1	Length #16 bare wire (heavy)
343-5	1	Length coax cable (RG-62/U)
344-50	1	Length hookup wire
347-7	1	Length 4-conductor cable
Metal Parts		
90-359	1	Cabinet
203-484	1	Front panel
203-254	1	Subpanel
205-312-1	1	Chassis
201-29-1	1	Chassis base
205-313	1	Bottom plate
205-314	1	Gear mounting plate
205-315-2	1	Dial plate
204-135	1	Angle bracket (small)
204-213	1	Angle bracket (pointed)
204-215	1	Dial pointer bracket (channel shaped)
204-423	1	Variable capacitor bracket
Assemblies		
[19] 100-19	1	Dial cord drum, small
100-165	1	Dial cord drum, large
100-125	1	Dial cylinder plug with bushing
100-132	2	Dial cylinder support with two pulleys
100-200	1	Dial cylinder shaft with pulley attached
100-201	1	Shaft with small gear
100-202	1	Shaft with large gear



Gears-Shafts-Bushing-Coupling-Pulley

451-12	1	Nylon gear
451-15	1	Brass gear
451-16	1	Anti-backlash gear
453-35	1	4-3/8" shaft
453-78	1	1-1/2" shaft
455-6	7	Shaft bushing
456-7	1	Shaft coupling
466-7	1	Dial pulley (small)

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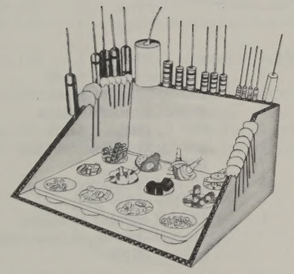
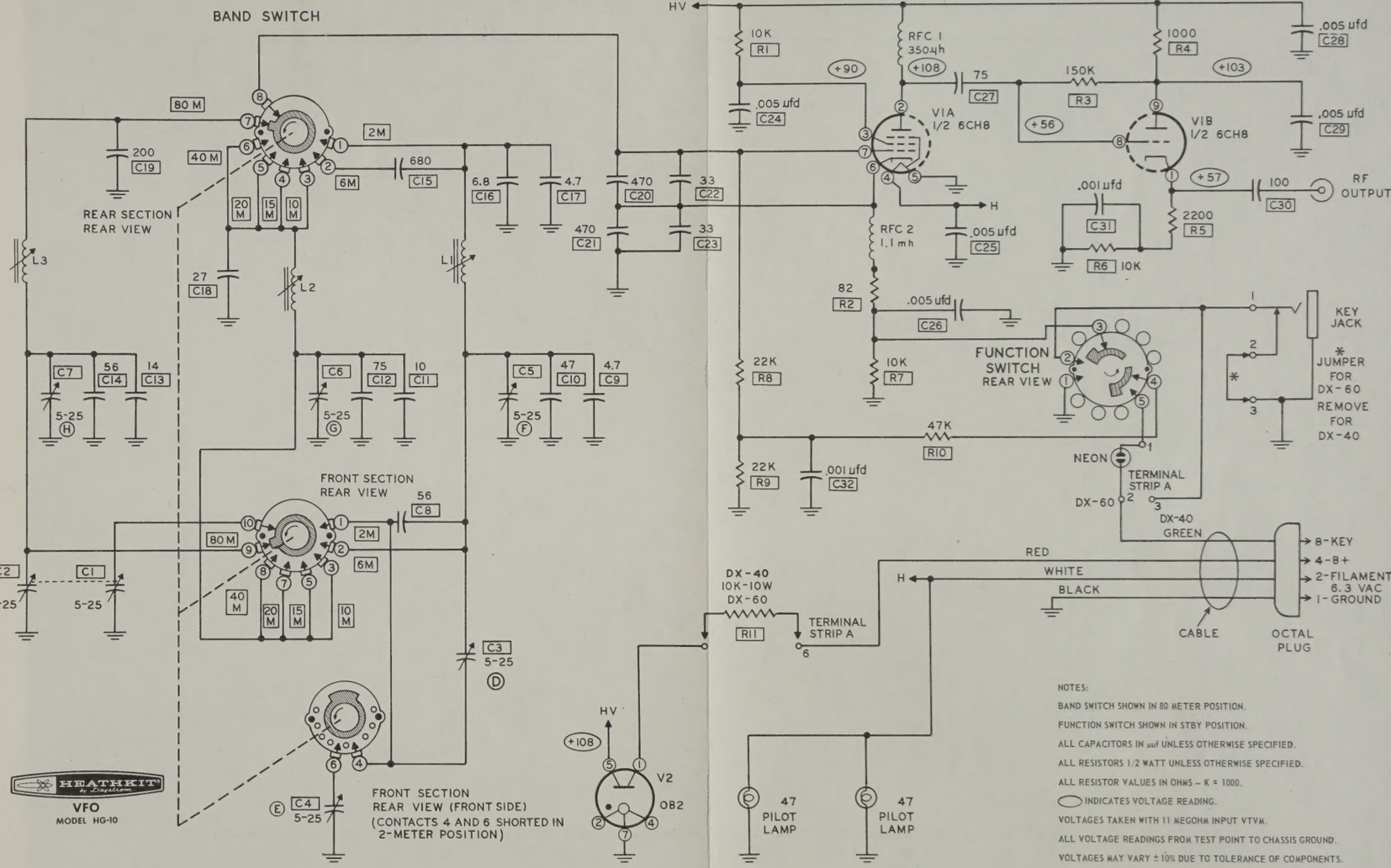
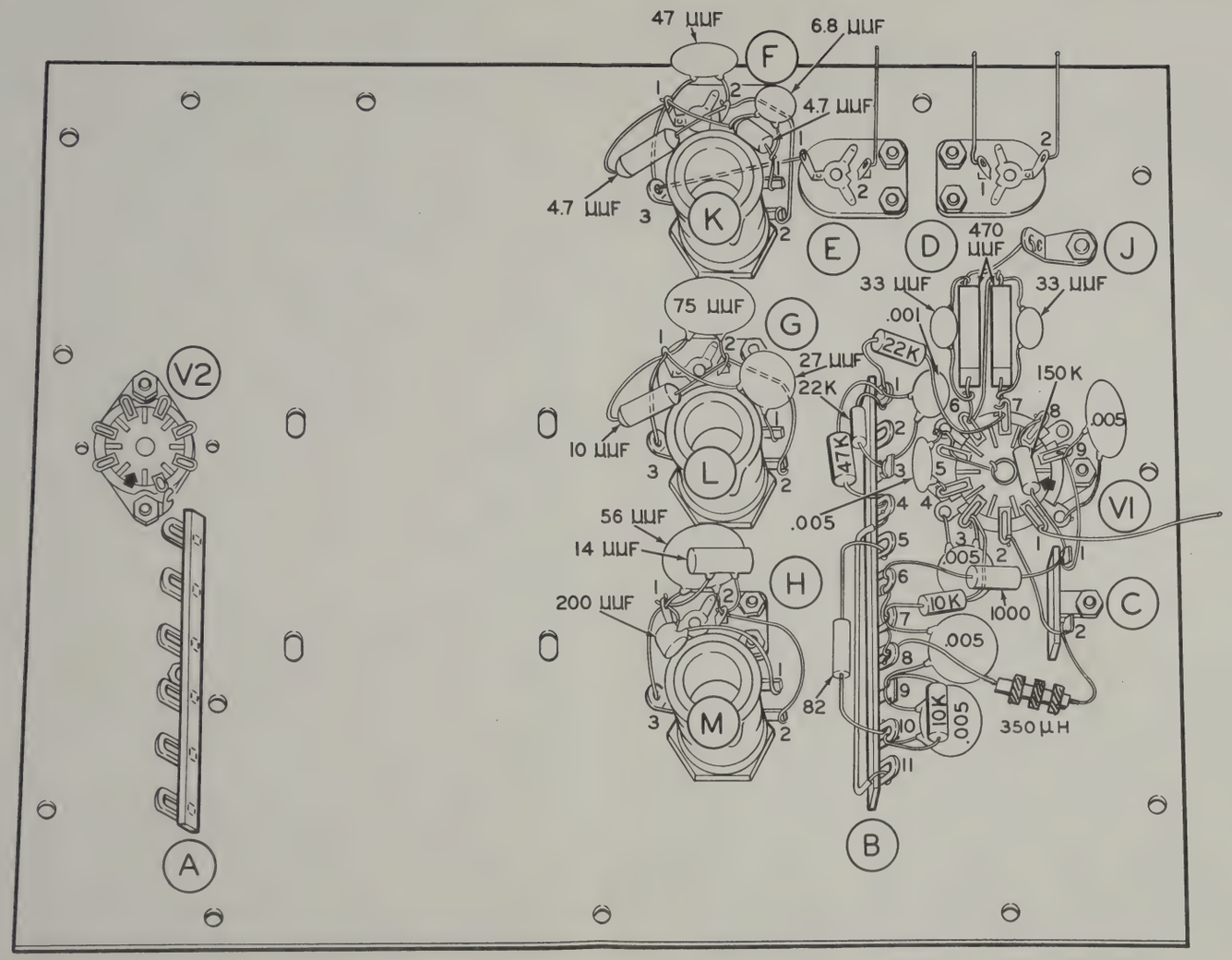






Pictorial 4

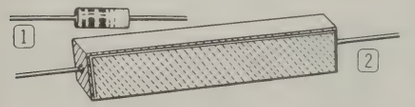
HEATHKIT

PARTS LIST

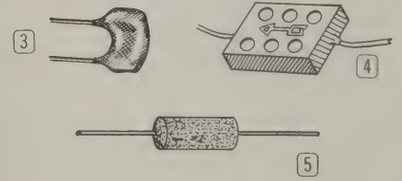
The circled numbers in the Parts List are keyed to the circled numbers on the parts drawings to aid in parts identification.

Disregard any numbers that are not on the Parts List when more than one number is on any package or part in this kit.

PART No.	PARTS Per Kit	DESCRIPTION
Resistors		
(1) 1-118	1	82 Ω 1/2 watt (gray-red-black)
1-9	1	1000 Ω 1/2 watt (brown-black-red)
1-44	1	2200 Ω 1/2 watt (red-red-red)
1-20	3	10 KΩ 1/2 watt (brown-black-orange)
1-22	2	22 KΩ 1/2 watt (red-red-orange)
1-25	1	47 KΩ 1/2 watt (yellow-violet-orange)
1-27	1	150 KΩ 1/2 watt (brown-green-yellow)
(2) 3-7-10	1	10 KΩ 10 watt, wire-wound



Capacitors		
(3) 20-102	1	100 µµf silver mica
20-108	1	200 µµf silver mica
(4) 20-40	2	470 µµf molded mica
20-107	1	680 µµf silver mica
(5) 21-29	2	4.7 µµf tubular ceramic (N750)
21-28	1	10 µµf tubular ceramic (N750)
21-41	1	14 µµf tubular ceramic (purple-brown-yellow-black-green, N750)



PART No.	PARTS Per Kit	DESCRIPTION
Capacitors (cont'd.)		
(6) 21-61	1	6.8 µµf disc ceramic (NPO)
21-6	1	27 µµf disc ceramic (NPO)
21-7	2	33 µµf disc ceramic (N750)
21-40	1	47 µµf disc ceramic (NPO)
21-85	2	56 µµf disc ceramic (NPO)
21-86	2	75 µµf disc ceramic (NPO)
21-140	2	.001 µfd disc ceramic
21-57	5	.005 µfd disc ceramic
26-52	1	2-section variable, 5-25 µµf per section
31-17	5	Trimmer, 5-25 µµf (NPO)

Coils		
40-329	2	VFO coil
40-381	1	VFO coil (80-Meter)
45-82	1	350 microhenry RF choke
45-4	1	1.1 millihenry RF choke
Switches		
63-280	1	7-position, 2-section rotary
63-282	1	3-position, 1-section rotary
Tubes-Lamps		
411-46	1	6OB2 tube
411-159	1	6CH8 tube
412-1	2	#47 lamp
412-11	1	NE-2 neon lamp
Hardware		
(7) 250-49	16	3-48 x 1/4" screw
(8) 250-135	1	5-40 x 5/16" hex head screw
(9) 250-120	1	5-40 x 7/8" threaded stud
(10) 250-124	1	6-32 x 3/16" screw
(11) 250-56	39	6-32 x 1/4" screw
250-89	17	6-32 x 3/8" screw
250-10	4	6-32 x 1/2" screw
(12) 250-170	12	#6 x 1/4" sheet metal screw

PART No.	PARTS Per Kit	DESCRIPTION
Miscellaneous		
73-4	2	Rubber grommet
75-30	1	Plastic strain relief
261-9	4	Rubber foot
349-1	1	Length dial cord
446-61	1	Dial window
462-257	1	Large knob
462-122	2	Small knob
463-15	1	Dial pointer
464-19	1	Dial cylinder (plastic)
485-7	1	Dial cylinder plug (1/4" center hole)
490-5	1	Nut starter
391-34	1	Blue and white identification label
597-260	1	Parts order form
597-308	1	Kit Builder's Guide
	1	Manual (See front cover for part number.)
		Solder

To order a replacement part, use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual.

PROPER SOLDERING TECHNIQUES

Only a small percentage of HEATHKIT equipment purchasers find it necessary to return an instrument for factory service. Of these instruments, by far the largest portion of malfunctions are due to poor or improper soldering.

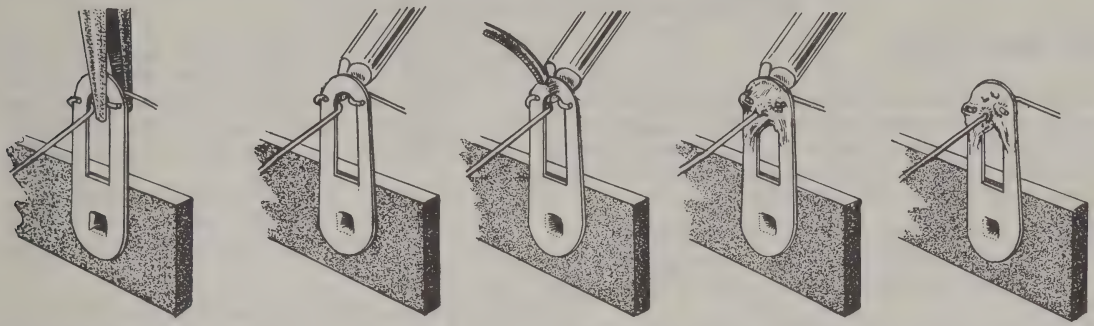
If terminals are bright and clean and free of wax, frayed insulation and other foreign substances, no difficulty will be experienced in soldering. Correctly soldered connections are essential if the performance engineered into a kit is to be fully realized. If you are a beginner with no experience in soldering, a half hour's practice with some odd lengths of wire may be a worthwhile investment.

For most wiring, a 25 to 100 watt iron or its equivalent in a soldering gun is very satisfactory. A lower wattage iron than this may not heat the connection enough to flow the solder smoothly over the joint. Keep the iron tip clean and bright by wiping it from time to time with a cloth.

CHASSIS WIRING AND SOLDERING

1. All wire used, except the heavy bare wire, is the type with colored insulation (hookup wire). In preparing a length of hookup wire, 1/4" of insulation should be removed from each end unless directed otherwise in the construction step.
2. Leads on resistors, capacitors and similar components are generally much longer than they need to be to make the required connections. In these cases, the leads should be cut to proper length before the part is added to the chassis. In general, the leads should be just long enough to reach their terminating points.
3. Crimp or bend the wire around the terminal just enough to hold it in place until it is soldered. Do not knot or twist the wire around the lug. For the heavy bare wire, position the wire so that a good solder connection can be made.
4. Position the work, if possible, so that gravity will help to keep the solder where you want it.
5. Place a flat side of the soldering iron tip against the joint to be soldered until it is heated sufficiently to melt the solder.
6. Then place the solder against the heated terminal and it will immediately flow over the joint; use only enough solder to thoroughly wet the junction. It is usually not necessary to fill the entire hole in the terminal with solder.
7. Remove the solder and then the iron from the completed junction. Use care not to move the leads until the solder is solidified.

A poor or cold solder joint will usually look crystalline and have a grainy texture, or the solder will stand up in a blob and will not have adhered to the joint. Such joints should be reheated until the solder flows smoothly over the entire junction. In some cases, it may be necessary to add a little more solder to achieve a smooth bright appearance.



CRIMP WIRES | HEAT CONNECTION | APPLY SOLDER | ALLOW SOLDER TO FLOW | PROPER SOLDER CONNECTION

ROSIN CORE SOLDER HAS BEEN SUPPLIED WITH THIS KIT. THIS TYPE OF SOLDER MUST BE USED FOR ALL SOLDERING IN THIS KIT. ALL GUARANTEES ARE VOIDED AND WE WILL NOT REPAIR OR SERVICE EQUIPMENT IN WHICH ACID CORE SOLDER OR PASTE FLUXES HAVE BEEN USED. IF ADDITIONAL SOLDER IS NEEDED, BE SURE TO PURCHASE ROSIN CORE (60:40 or 50:50 TIN-LEAD CONTENT) RADIO TYPE SOLDER.

STEP-BY-STEP PROCEDURE

The following instructions are presented in a logical step-by-step sequence to enable you to complete your kit with the least possible confusion. Be sure to read each step all the way through before beginning the specified operation. Also read several steps ahead of the actual step being performed. This will familiarize you with the relationship of the subsequent operations. When the step is completed, check it off in the space provided. This is particularly important as it may prevent errors or omissions, especially if your work is interrupted. Some kit builders have also found it helpful to mark each lead in colored pencil on the Pictorial as it is added.

The fold-out diagrams in this manual may be removed and attached to the wall above your working area; but, because they are an integral part of the instructions, they should be returned to the manual after the kit is completed.

In general, the illustrations in this manual correspond to the actual configuration of the kit; however, in some instances the illustrations may be slightly distorted to facilitate clearly showing all of the parts.

The abbreviation "NS" indicates that a connection should not be soldered yet as other wires will be added. When the last wire is installed, the terminal should be soldered and the abbreviation "S" is used to indicate this. Note that a number will appear after each solder instruction. This number indicates the number of leads that are supposed to be connected to the terminal in point before it is soldered. For example, if the instruction reads, "Connect a lead to lug 1 (S-2)," it will be understood that there will be two leads connected to the terminal at the time it is soldered. (In cases where a lead passes through a terminal or lug and then connects to another point, it will count as two leads, one entering and one leaving the terminal.)

The steps directing the installation of resistors include color codes to help identify the parts. Also, if a part is identified by a letter-number designation on the Schematic, its designation will appear at the beginning of the construction step which directs its installation.

STEP-BY-STEP ASSEMBLY

DIAL MECHANISM

All of the parts used in the dial mechanism are shown on Pictorials 1 and 2. The following steps are keyed to the pictorials by circled numbers. Follow the steps carefully and refer to Pictorials 1 and 2 as each part is installed.

(1) ( ) Position the subpanel as shown, using the holes in the subpanel as a guide for correct orientation.

(2) ( ) Install the two rubber grommets in the subpanel.

NOTE: The Heath Company has provided a plastic nut starter with this kit. Use this nut starter to hold and start 6-32 and 3-48 nuts on screws. Refer to Page 3 of the Kit Builders Guide for further information.

(3) ( ) Mount the pointed angle bracket to the subpanel with four 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts. Be sure the pointed end of this bracket is placed as shown. Do not tighten the screws yet.

(4) ( ) Locate the two 1-1/4" shouldered spacers. Secure one end of each spacer at the correct point on the subpanel as indicated in Pictorial 1. Use 6-32 x 1/4" screws, #6 lockwashers, and 1/2" OD flat washers.

(5) ( ) Mount a shaft bushing on the subpanel. Use a control lockwasher and control nut.

(6) ( ) Mount two shaft bushings on the gear mounting plate. Be sure to use control washers and control nuts as shown in Pictorial 1.

(7) ( ) Place the 5-40 x 5/16" hex head screw through the gear tension spring. Secure this screw and spring to the gear mounting plate as shown, using a 5-40 nut. The bent end of the spring should fit into the small hole of the plate. Bend this end of the spring over so it will not pull back through the plate.

(8) ( ) Place the 6-32 x 3/16" screw through the gear mounting plate and fasten it with a #6 lockwasher and 6-32 nut as shown.

(9) ( ) Locate the gear shaft assembly with the small brass gear (#100-201, in the small cardboard box). Insert the shorter shaft end of this assembly through the bushing in the subpanel.

(10) ( ) Locate the shaft coupling and start two 6-32 x 1/8" setscrews into it. Be careful to get the screws started straight.

(11) ( ) Place the shaft coupling over the longer end of the remaining gear-shaft assembly (#100-202). Position the end of the shaft half way into the coupling and tighten the setscrew. Place the coupling through the large hole in the subpanel.

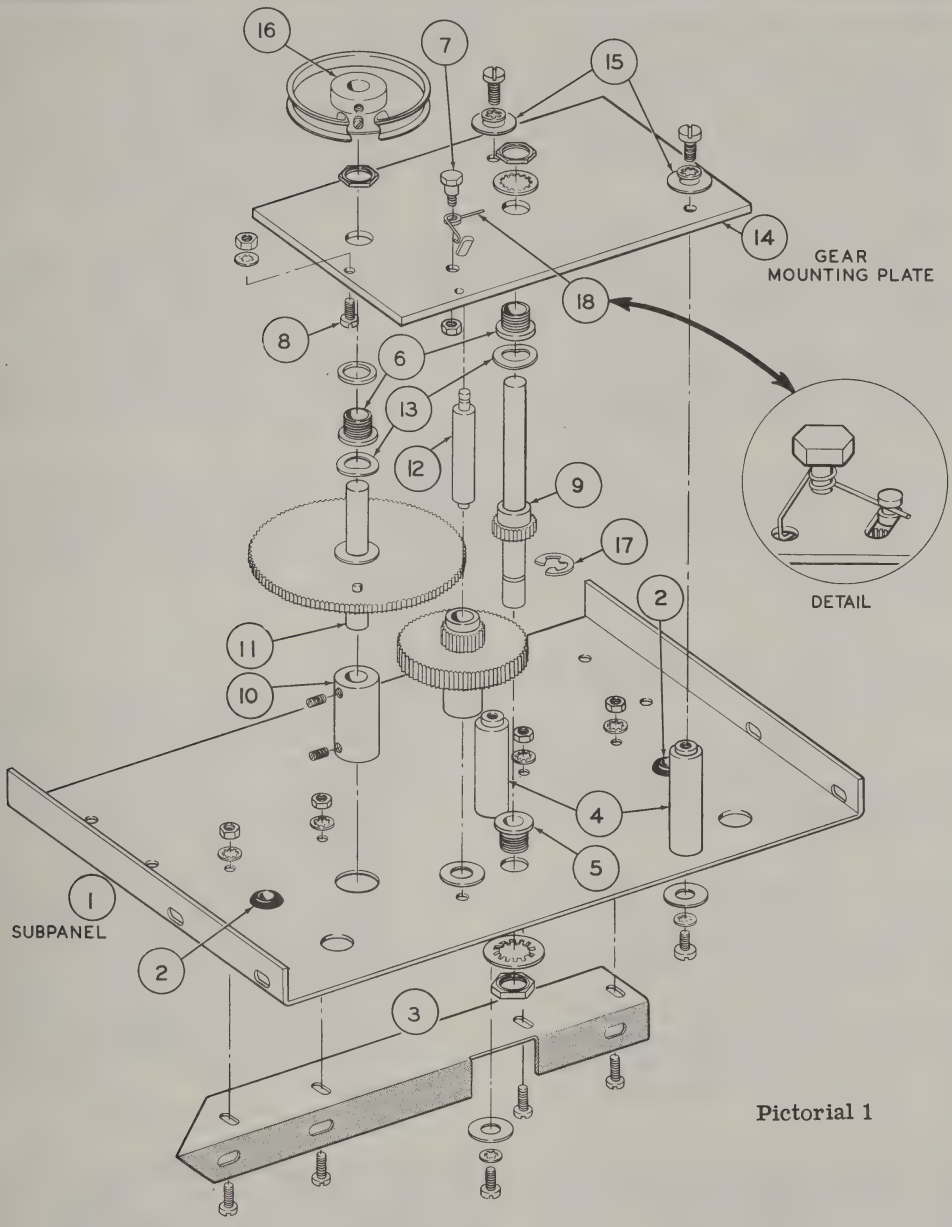
(12) ( ) Place the 1-1/2" shaft through the nylon gear. The shaft ends are different, and should be placed as shown on Pictorial 1. Place a 9/16" OD flat washer over the lower shaft end, then insert this end of the shaft into the correct hole of the subpanel as shown in Pictorial 1. The nylon gear mounts below the large gear of step 11, as shown.

(13) ( ) Place spring washers over the shafts of the two gear-shaft assemblies.

(14) ( ) Set the gear mounting plate over the shafts and spacers extending up from the subpanel. The shafts of the gear-shaft assemblies should fit through the two shaft bushings in the plate, and the shoulders of the two spacers should fit into the correct two holes of the plate. The nylon gear should mesh with the two adjacent gears.

(15) ( ) Fasten the gear mounting plate in place with 6-32 x 1/4" screws, #6 lockwashers, and 1/2" OD flat washers; place the screws into the ends of the spacers.

(16) ( ) Start an 8-32 x 1/4" slotted setscrew into the bushing of the larger dial cord drum. Place this dial cord drum over the end of the shaft with the large gear. Position the drum so that the spring washer between the gear and gear mounting plate is slightly compressed. The dial cord exit in the side



Pictorial 1

of the drum should be placed in the same angular position as the stop pin of the large gear. Now tighten the set-screw.

(17) (√) Install the E washer in the groove in the shaft of the other gear-shaft assembly. The spring washer above the gear on this shaft should now be slightly compressed.

(18) (√) Place the straight end of the gear tension spring against the notch in the end of the nylon gear shaft. This will hold the nylon gear in mesh with the other two gears.

Refer to Pictorial 2 for the following steps.

(19) ( ) Mount the two pilot lamp sockets on the subpanel. Use a 6-32 x 3/8" screw, two #6 lockwashers, a #6 solder lug, and a 6-32 nut. Position the solder lug as shown before tightening.

(20) ( ) Install a shaft bushing in each of the two dial cylinder supports. Use control lockwashers and control nuts as shown in the Detail on Pictorial 2.

NOTE: In the following steps, it is important to position the plastic dial cylinder so that its numbering will be right side up. Study the numbering on the cylinder before proceeding.

(21) ( ) Insert the dial cylinder plug with the bushing attached to it (#100-125) into the end of the dial cylinder with the lowest frequency numbering. Start an 8-32 x 1/4" slotted head setscrew into the bushing. Line this screw up with the 6 Meter scale.

(22) ( ) Insert the dial cylinder plug with the 1/4" center hole into the other end of the dial cylinder.

(23) ( ) Place the dial cylinder shaft through the dial drum plugs. Insert it from the end with the highest frequency numbering.

(24) ( ) Place the two dial cylinder supports at the ends of the dial cylinder just assembled. The shaft extending from each end should fit into the bushings of the supports.

(25) ( ) Mount the dial cylinder supports and dial cylinder to the subpanel, using 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

(26) ( ) Push the dial cylinder bushing of the dial drum plug against the dial drum support. Be sure there is no excessive lateral movement and that the dial indicator turns smoothly. Then tighten the screw in the bushing of the dial drum plug.

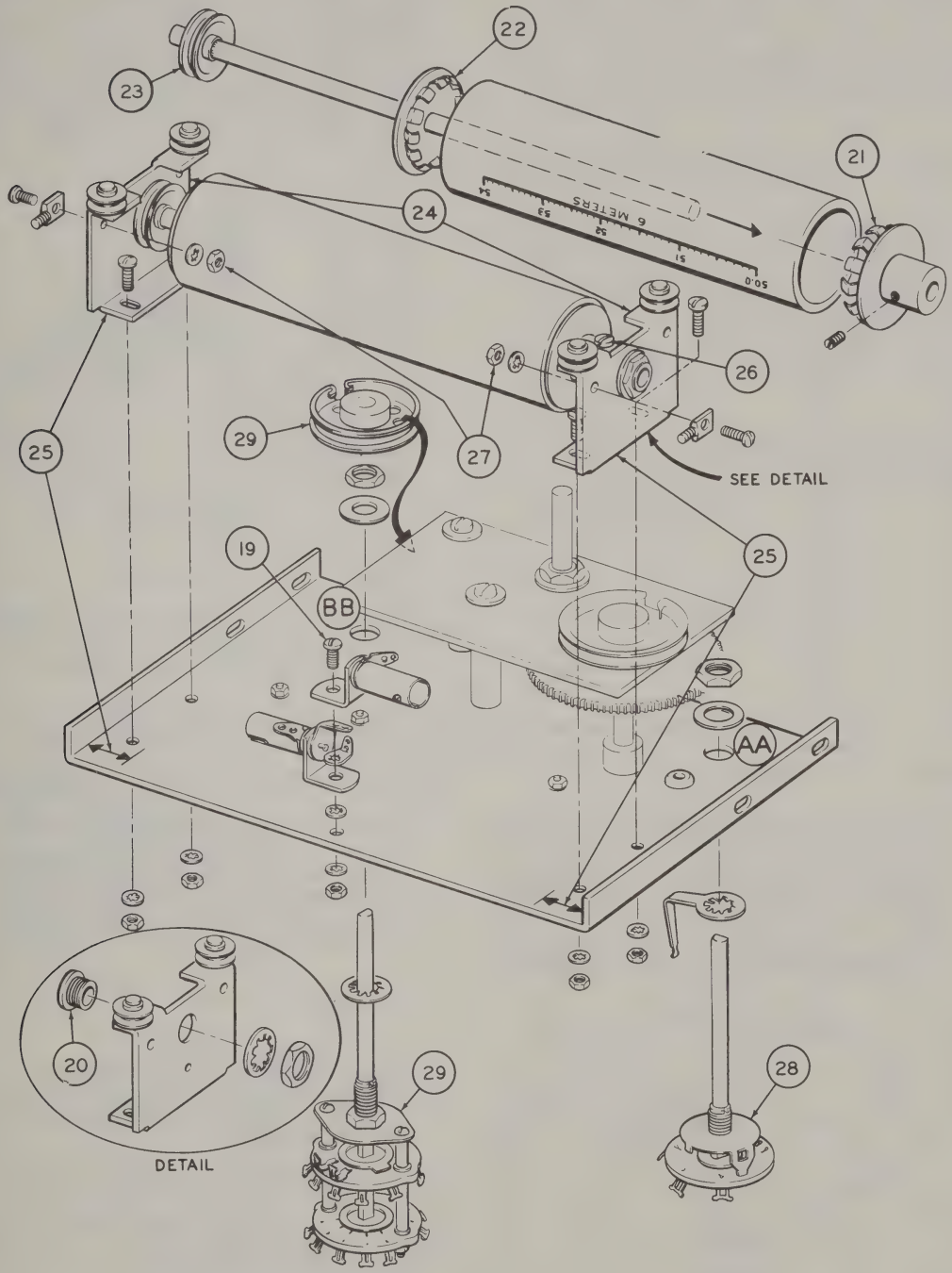
(27) ( ) Mount a 6-32 spade bolt on each of the dial cylinder supports. Use 6-32 x 1/4" screws, #6 lockwashers, and 6-32 nuts. Make sure the offset shoulder of each spade bolt fits over the edge of the dial cylinder support as indicated in Pictorial 2. Be sure to use the correct mounting hole in each support.

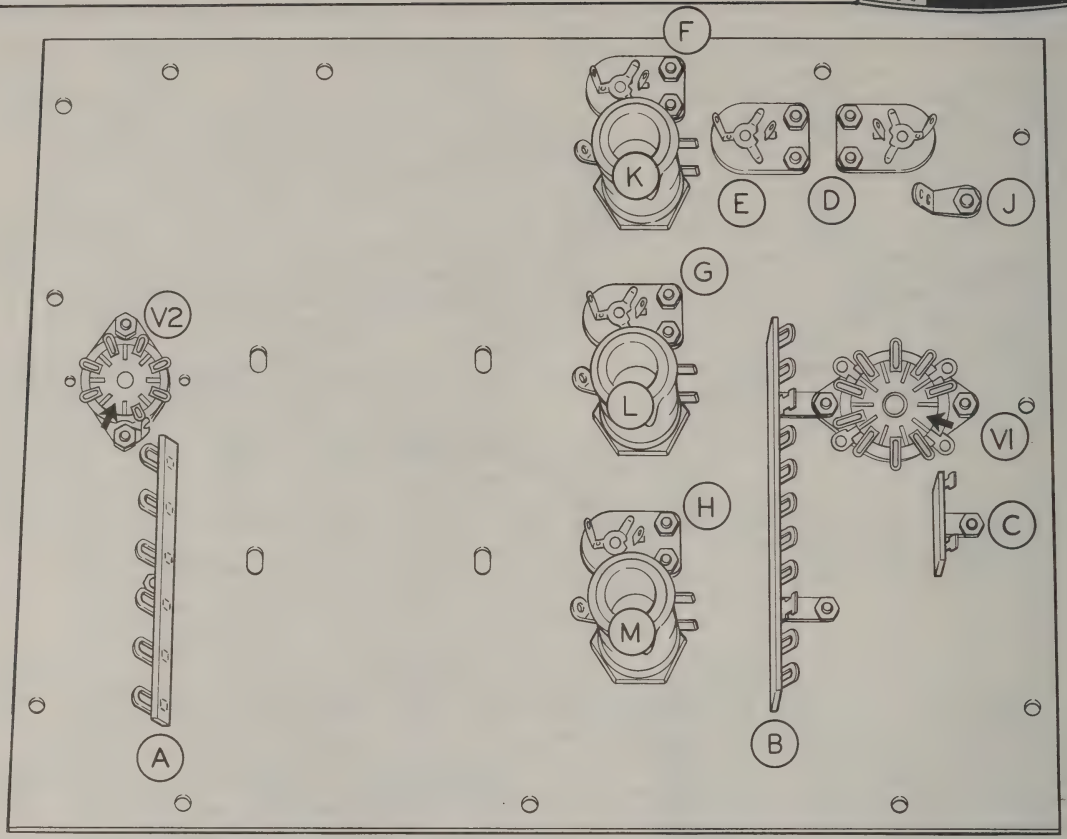
(28) ( ) Mount the 1-section rotary switch (#63-282) on the subpanel, using a control solder lug, control flat washer, and control nut. Refer forward to Pictorial 5 (fold-out from Page 21) for positioning of this switch and the solder lug (location AA).

NOTE: In the next step, the dial cord drum will not fit onto the switch shaft after the switch is mounted. To avoid difficulty, study the switch mounting sequence in Pictorial 2 before performing step 29.

(29) ( ) Insert an 8-32 x 1/4" slotted setscrew in the bushing of the small dial cord drum. Mount the remaining rotary switch (#63-280) on the subpanel and mount the small dial cord drum on the shaft just below the gear mounting plate. Use a control lockwasher, control flat washer, and control nut to mount the switch. Refer forward to Pictorial 5 for positioning of this switch (location BB). Turn the switch shaft fully counterclockwise, and set the dial cord drum so its opening is aimed at the closest corner of subpanel as shown in Pictorial 2, and tighten the setscrew so the drum is about 5/8" from the subpanel.

This completes assembly of the dial mechanism. See that all shafts turn freely, with no binding. A drop of light oil should be applied to each of the shaft bushings. Also make sure that the dial cylinder is parallel to the edge of the subpanel. Now set the dial mechanism aside until it is called for later.


22
23
21
24
6 METERS
26
29
27
25
SEE DETAIL
19
BB
25
AA
20
DETAIL
29
28



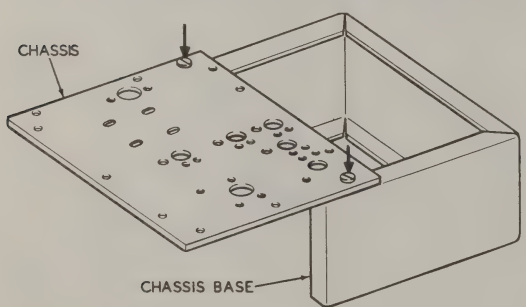
Pictorial 3

CHASSIS PARTS MOUNTING

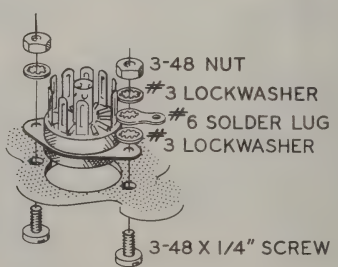
Refer to Pictorial 3 for the following steps.

(✓) Orient the chassis as shown in Pictorial 3, lettered side down, then temporarily attach it to the chassis base as shown in Detail 3A. Use two 6-32 x 1/4" screws and 6-32 nuts. The chassis base will serve as a fixture to hold the chassis up during the parts mounting and initial wiring operations.

(✓) Mount the 7-pin tube socket at V2. Use 3-48 x 1/4" screws, #3 lockwashers, a small #6 solder lug, and 3-48 nuts as shown in Detail 3B. Make sure the blank space of the socket is positioned as indicated by the arrow in Pictorial 3.

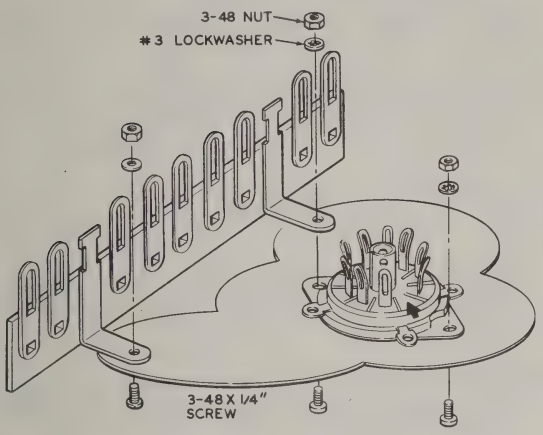


Detail 3A



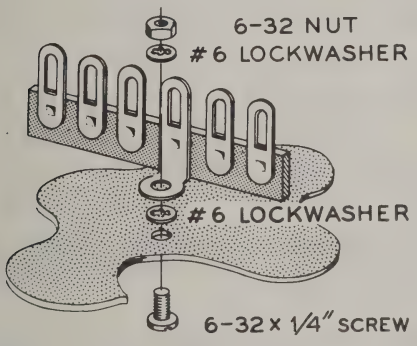
Detail 3B

( ) Mount the 9-pin tube socket at V1 along with 11-lug terminal strip B. Use 3-48 x 1/4" screws, #3 lockwashers, and 3-48 nuts as shown in Detail 3C. See that the blank space of the tube socket is positioned as indicated by the arrow in Pictorial 3.



Detail 3C

( ) Mount 6-lug terminal strip A. Use a 6-32 x 1/4" screw, #6 lockwashers, and a 6-32 nut as shown in Detail 3D.



Detail 3D

( ) In a similar manner, mount 2-lug terminal strip C, using a 3-48 x 1/4" screw, #3 lockwashers, and a 3-48 nut.

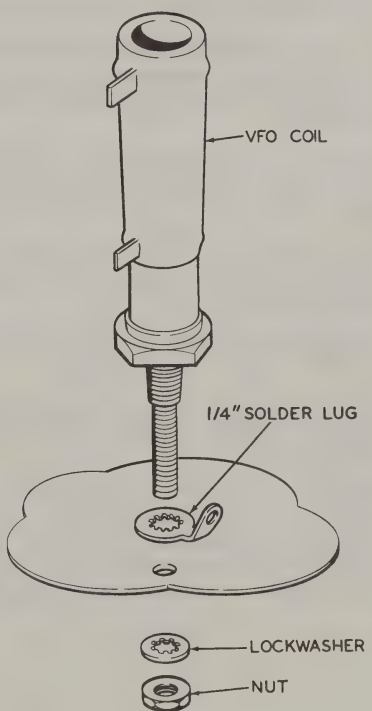
( ) C3. Mount trimmer capacitor D with 3-48 x 1/4" screws, #3 lockwashers, and 3-48 nuts. Position the trimmer as shown in Pictorial 3 and then place the screws up through the chassis and trimmer. Fasten the screws with lockwashers and nuts. Check to see that the rotating part of the trimmer turns freely.

( ) C4, C5, C6, C7. In the same way, mount trimmer capacitors E (C4), F (C5), G (C6), and H (C7).

( ) Using a 6-32 x 1/4" screw and a 6-32 nut, mount a #6 solder lug at J.

( ) L1, L2. Locate the two identical VFO coils (#40-329). Mount these coils at K and L. Use the nut and lockwasher furnished with each coil plus a 1/4" solder lug. Refer to Detail 3E which shows the mounting procedure. Place the coil lugs and solder lugs of each coil as shown in Pictorial 3.

( ) L3. Mount the 80-meter coil (#40-381) at M. Use the nut and lockwasher furnished with the coil, plus a 1/4" solder lug as for the previous coils.



Detail 3E

CHASSIS WIRING

Refer to Pictorial 4 (fold-out from Page 6) for the following steps.

NOTE: Hookup wire should be used in the wiring steps associated with Pictorial 4. When bare wire is call for, use the #20 (small) bare wire. The heavy bare wire should not be used until it is specifically called for in a later section.

( ) Connect one end of a 1-1/2" bare wire to lug 2 of trimmer D (S-1). Leave the other end free.

( ) Connect one end of a 1-1/2" bare wire to lug 1 of trimmer D (S-1). Leave the other end free.

( ) Connect one end of a 1-1/2" bare wire to lug 2 of trimmer E (S-1). Leave the other end free.

( ) Connect a 2" bare wire from lug 1 of trimmer F (NS), through ground lug 3 of coil K (NS), to lug 1 of trimmer E (S-1). Now solder ground lug 3 of coil K (S-2).

NOTE: When installing capacitors and resistors, cut the leads just long enough to make the proper connections with the parts placed as shown in Pictorial 4.

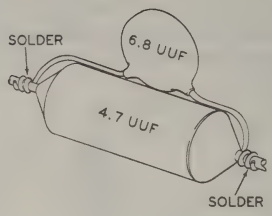
*In the steps indicated with an asterisk (*), cut the component leads to 3/8" before wiring in the part.

*( ) C9. Connect a 4.7 μμf tubular ceramic capacitor between lugs 1 (NS) and 2 (NS) of trimmer F.

( ) Connect a bare wire from lug 2 of trimmer F (NS) to lug 2 of coil K (NS).

*( ) C10. Connect a 47 μμf disc ceramic capacitor between lugs 1 (NS) and 2 (S-3) of trimmer F.

( ) C16, C17. Prepare a 6.8 μμf disc ceramic capacitor and 4.7 μμf tubular ceramic capacitor combination as shown in Detail 4A. Connect this combination from lug 1 of trimmer F (S-4) to lug 1 of coil K (NS).



Detail 4A

( ) Connect a bare wire from lug 1 of trimmer G (NS) to ground lug 3 of coil L (S-1).

*( ) C11. Connect a 10 μμf tubular ceramic capacitor between lugs 1 (NS) and 2 (NS) of trimmer G.

*( ) C12. Connect a 75 μμf disc ceramic capacitor between lugs 1 (NS) and 2 (NS) of trimmer G.

( ) Connect a bare wire from lug 2 of trimmer G (S-3) to lug 2 of coil L (NS).

( ) C18. Connect a 27 μμf disc ceramic capacitor from lug 1 of trimmer G (S-4) to lug 1 of coil L (NS).

( ) Connect a bare wire from lug 1 of trimmer H (NS) to ground lug 3 of coil M (S-1).

*( ) C14. Connect a 56 μμf disc ceramic capacitor between lugs 1 (NS) and 2 (NS) of trimmer H.

*( ) C13. Connect a 14 μμf tubular ceramic capacitor between lugs 1 (NS) and 2 (NS) of trimmer H.

( ) Connect a bare wire from lug 2 of trimmer H (S-3) to lug 2 of coil M (NS).

( ) C19. Connect a 200 μμf mica capacitor from lug 1 of trimmer H (S-4) to lug 1 of coil M (NS).

( ) Connect a 2-1/2" hookup wire between lugs 4 (NS) and 11 (NS) of terminal strip B.

NOTE: All resistors shown on Pictorial 4 are 1/2 watt.

( ) R9. Connect a 22 KΩ (red-red-orange) resistor between lugs 1 (NS) and 3 (NS) of terminal strip B.

( ) R10. Connect a 47 KΩ (yellow-violet-orange) resistor between lugs 1 (NS) and 4 (S-2) of terminal strip B.

( ) C32. Connect a .001 μfd disc ceramic capacitor between lugs 1 (NS) and 3 (S-2) of terminal strip B.

( ) Connect a bare wire from lug 6 (NS), through lug 7 (NS), to lug 8 (NS) of terminal strip B.

( ) R2. Connect an 82 Ω (gray-red-black) resistor between lugs 5 (NS) and 10 (NS) of terminal strip B.

( ) C26. Connect a .005 μfd disc ceramic capacitor between lugs 9 (NS) and 10 (NS) of terminal strip B.

( ) C28. Connect a .005 μfd disc ceramic capacitor between lugs 7 (NS) and 9 (NS) of terminal strip B.

( ) R7. Connect a 10 KΩ (brown-black-orange) resistor between lugs 9 (S-3) and 10 (NS) of terminal strip B.

( ) RFC1. Connect the 350 microhenry RF choke from lug 8 of terminal strip B (NS) to lug 2 of terminal strip C (NS).

( ) C24. Connect a .005 μfd disc ceramic capacitor from lug 3 of tube socket V1 (NS) to the ground lug of this socket near lug 3 (S-1).

( ) R1. Connect a 10 KΩ (brown-black-orange) resistor from lug 7 of terminal strip B (S-4) to lug 3 of tube socket V1 (S-2).

( ) R4. Connect a 1000 Ω (brown-black-red) resistor from lug 6 of terminal strip B (S-2) to lug 1 of terminal strip C (NS).

( ) Connect a 1-1/4" hookup wire from lug 2 of tube socket V1 (NS) to lug 2 of terminal strip C (S-2).

( ) Connect a 1-1/4" hookup wire from lug 9 of tube socket V1 (NS) to lug 1 of terminal strip C (NS).

( ) C29. Connect a .005 μfd disc ceramic capacitor from lug 9 of tube socket V1 (S-2) to the ground lug of this socket near lug 1 (S-1). Dress this capacitor to avoid the area near the edge of the chassis where the chassis base will be mounted later.

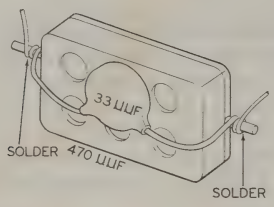
( ) Connect one end of a 1-1/2" bare wire to lug 1 of tube socket V1 (S-1). Leave the other end free.

( ) R3. Connect a 150 KΩ (brown-green-yellow) resistor from lug 1 of terminal strip C (S-3) to lug 8 of tube socket V1 (NS).

( ) Connect a bare wire from the center post (NS), through lug 5 (NS), to the socket ground lug near lug 6 (NS) of tube socket V1. Now solder lug 5 (S-2) and the center post (S-1).

*( ) C25. Connect a .005 μfd disc ceramic capacitor from lug 4 of tube socket V1 (NS) to the ground lug of this socket near lug 6 (S-2).

( ) C21, C23. Prepare a 470 μμf molded mica capacitor and a 33 μμf disc ceramic capacitor combination, as shown in Detail 4B.



Detail 4B

( ) Connect this combination from lug 6 of tube socket V1 (NS) to ground lug J (S-1). Leave room for the other capacitor combination shown in Pictorial 4.

( ) C20, C22. Prepare another 470 μμf molded mica capacitor and 33 μμf disc ceramic capacitor combination, as shown in Detail 4B.

( ) Connect this combination between lugs 6 (NS) and 7 (NS) of tube socket V1. Place this combination next to the one just installed.

*( ) R8. Connect a 22 KΩ (red-red-orange) resistor from lug 1 of terminal strip B (S-4) to lug 7 of tube socket V1 (NS).

( ) Remove the two screws used to temporarily hold the chassis to the chassis base.

Refer to Detail 5A for the following steps.

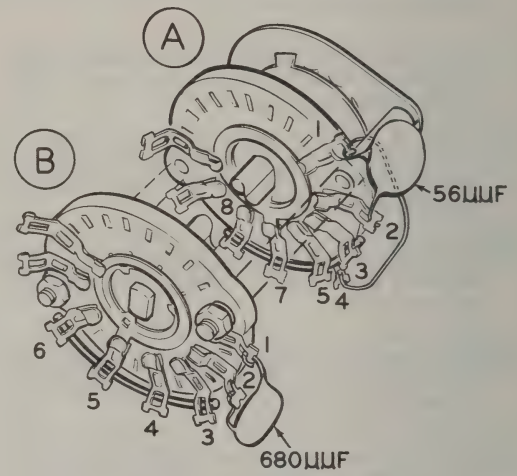
NOTE: Be careful not to damage the contacts or ceramic wafers of switch BB when making connections in the following steps.

( ) Form a 1-1/4" length of #20 bare wire to fit around lugs 3, 5, 7, and 8 of wafer A. Solder this bare wire to lugs 3, 5, and 7, but do not solder to lug 8 yet. Note that lugs 4 and 6 are on the other side of the wafer and are not involved in this step.

( ) In a similar manner, form another 1-1/4" length of #20 bare wire and place this wire around lugs 3, 4, 5, and 6 of wafer B as shown in Detail 5A. Solder lugs 4, 5, and 6, but do not solder lug 3 yet.

( ) C8. Connect one lead of a 56 μμf disc ceramic capacitor through lug 1 (NS) to lug 4 (NS) of wafer A. Now solder lug 1 (S-2). Connect the other lead to lug 2 of wafer A (NS). Be careful that these leads do not short to any metal parts of this switch.

( ) C15. Connect a 680 μμf silver mica capacitor between lugs 1 (NS) and 2 (S-1) of wafer B.



Detail 5A

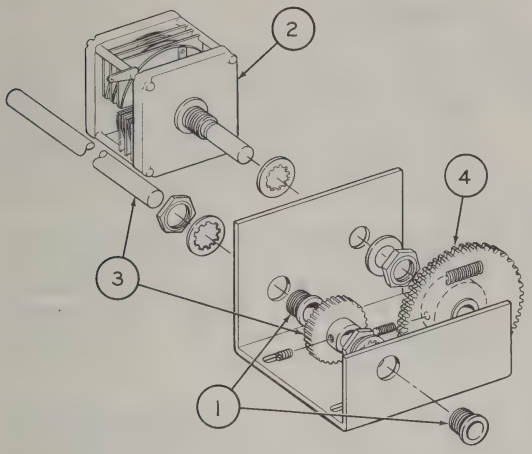
CHASSIS-TO-DIAL MECHANISM ASSEMBLY

Refer to Pictorial 5 (fold-out from Page 21) for the following step.

( ) Mount the chassis to the dial mechanism, using three 6-32 x 1/4" screws, #6 lockwashers, and 6-32 nuts. The screws should be placed through the pointed bracket of the dial mechanism, then through the chassis, and fastened with lockwashers and nuts. See that the edges of the chassis line up with the sides of the dial mechanism. Do not tighten the screws yet.

Refer to Detail 5B for the following steps.

NOTE: When putting the variable capacitor assembly together, be careful to position each part as shown in Detail 5B. Be sure to keep the capacitor plates fully meshed, when possible, to avoid damage. The circled numbers in Detail 5B are keyed to the circled numbers in the following steps.



Detail 5B

(1) ( ) Install two shaft bushings on the variable capacitor bracket. Use control lockwashers and control nuts.

(2) ( ) C1, C2. Mount the variable capacitor on the bracket with a control lockwasher, control flat washer, and control nut. Position the capacitor as shown.

(3) ( ) Locate the 4-3/8" shaft and brass gear. Place the shaft through the first bushing, through the gear, and into the second bushing as shown. Start an 8-32 x 1/4" setscrew into the gear. Position the gear at the middle of the shaft and tighten the setscrew. This will prevent the shaft from falling out of the assembly. Final positioning of the gear and shaft will be taken care of later.

(4) ( ) Start an 8-32 x 1/4" slotted head setscrew into the anti-backlash gear. Place this gear on the shaft of the variable capacitor. Position the gear so the end of the shaft is flush with the outside surface of the gear; tighten the setscrew.

Refer to Pictorial 5 for the following steps.

( ) Mount the variable capacitor mechanism on the chassis, using four 6-32 x 1/4" screws, #6 lockwashers, and 6-32 nuts. Do not tighten yet.

( ) Loosen the setscrew in the brass gear, then slide the shaft forward into the shaft coupling extending from the dial mechanism. Tighten the setscrew of the shaft coupling onto the shaft. It may be necessary to loosen all the screws in the pointed mounting bracket and shift the dial mechanism to allow the shaft to line up and turn freely.

( ) Before meshing the gears in the next two steps, adjust the variable capacitor and the gear train to the proper position in the following manner: turn the tuning shaft coming from the front of the gear mounting plate to the fully counterclockwise position; turn the variable capacitor to the fully closed position.

( ) While holding one section of the anti-backlash gear, turn the other section one tooth so the teeth of the two sections line up; there will now be spring tension between the sections.

( ) Hold the anti-backlash gear as just directed and move the brass gear to mesh with the anti-backlash gear. Tighten the setscrew in the brass gear.

( ) Position the variable capacitor mechanism so there is no binding of the shaft running to the dial mechanism and then tighten the four screws holding the variable capacitor assembly to the chassis.

GENERAL WIRING

Refer to Pictorial 5 for the following steps.

( ) RFC2. Connect the 1.1 millihenry RF choke from lug 5 of terminal strip B (S-2) to lug 6 of tube socket V1 (S-3). Place the body of the choke over terminal strip B.

*( ) C27. Connect a 75 $\mu\mu$f disc ceramic capacitor between lug 2 (S-2) and lug 8 (S-2) of tube socket V1. Place the capacitor as shown.

( ) Bend the small solder lug mounted on one screw at tube socket V2 to touch lug 7 of this socket and solder (S-1).

( ) Bend the control solder lug near lug 1 of switch AA to touch this lug and solder (S-1).

( ) Connect one end of a 5" hookup wire to lug 3 of terminal strip A (NS). Dress this wire toward the rear of the chassis, as shown, and leave the end free.

( ) Connect a 7" hookup wire from lug 3 of terminal strip A (S-2) to lug 2 of switch AA (S-1).

( ) Connect a 6-1/2" hookup wire from lug 1 of terminal strip A (NS) to lug 5 of switch AA (S-1).

( ) Connect one end of a 13" hookup wire to lug 5 of terminal strip A (NS). Route this wire through grommet CC, then along the side of the dial mechanism, and over to the pilot lamp sockets. Leave the end free temporarily.

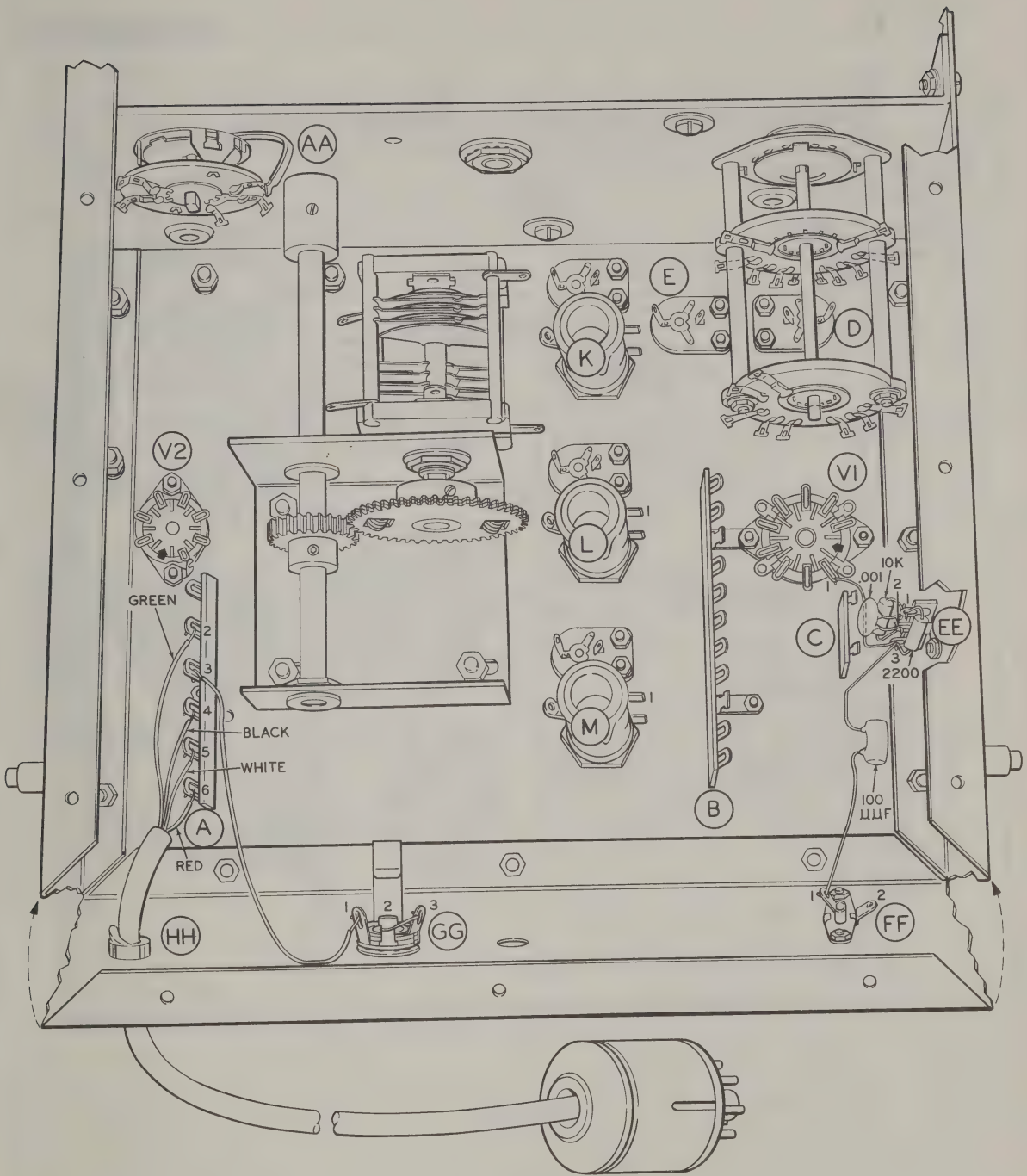
( ) Connect one end of a 15-1/2" hookup wire to lug 5 of tube socket V2 (S-1). Route this wire through grommet CC, across the subpanel, and back into the chassis area through grommet DD. Connect the end to lug 8 of terminal strip B (S-3).

( ) Connect one end of a 14" hookup wire to lug 3 of switch AA (S-1). Route this wire through grommet CC, across the subpanel, and back into the chassis area through grommet DD. Connect the end to lug 10 of terminal strip B (S-4).

( ) Connect one end of a 15" hookup wire to lug 4 of switch AA (S-1). Route this wire through grommet CC, across the subpanel, and back into the chassis area through grommet DD. Connect the other end to lug 11 of terminal strip B (S-2).

( ) Connect one end of a 14-1/2" hookup wire to lug 4 of tube socket V1 (S-2). This end of the wire should be placed under the wires already running to the tube socket. Route the other end of this wire through grommet DD, then along the side of the dial mechanism, and over to the pilot lamp sockets. Leave the end free temporarily.

( ) Check all of the long wires just installed to see that they are dressed neatly down against the chassis and subpanel. Be sure the wires are routed as shown in Pictorial 5.


AA
E
K
D
V2
L
VI
GREEN
10K
.001
2
C
EE
3
2200
BLACK
M
WHITE
B
100
μμF
A
RED
HH
GG
FF

Pictorial 6

GENERAL WIRING

Refer to Pictorial 5 for the following steps.

( ) RFC2. Connect the 1.1 millihenry RF choke from lug 5 of terminal strip B (S-2) to lug 6 of tube socket V1 (S-3). Place the body of the choke over terminal strip B.

*( ) C27. Connect a 75 $\mu\mu$f disc ceramic capacitor between lug 2 (S-2) and lug 8 (S-2) of tube socket V1. Place the capacitor as shown.

( ) Bend the small solder lug mounted on one screw at tube socket V2 to touch lug 7 of this socket and solder (S-1).

( ) Bend the control solder lug near lug 1 of switch AA to touch this lug and solder (S-1).

( ) Connect one end of a 5" hookup wire to lug 3 of terminal strip A (NS). Dress this wire toward the rear of the chassis, as shown, and leave the end free.

( ) Connect a 7" hookup wire from lug 3 of terminal strip A (S-2) to lug 2 of switch AA (S-1).

( ) Connect a 6-1/2" hookup wire from lug 1 of terminal strip A (NS) to lug 5 of switch AA (S-1).

( ) Connect one end of a 13" hookup wire to lug 5 of terminal strip A (NS). Route this wire through grommet CC, then along the side of the dial mechanism, and over to the pilot lamp sockets. Leave the end free temporarily.

( ) Connect one end of a 15-1/2" hookup wire to lug 5 of tube socket V2 (S-1). Route this wire through grommet CC, across the subpanel, and back into the chassis area through grommet DD. Connect the end to lug 8 of terminal strip B (S-3).

( ) Connect one end of a 14" hookup wire to lug 3 of switch AA (S-1). Route this wire through grommet CC, across the subpanel, and back into the chassis area through grommet DD. Connect the end to lug 10 of terminal strip B (S-4).

( ) Connect one end of a 15" hookup wire to lug 4 of switch AA (S-1). Route this wire through grommet CC, across the subpanel, and back into the chassis area through grommet DD. Connect the other end to lug 11 of terminal strip B (S-2).

( ) Connect one end of a 14-1/2" hookup wire to lug 4 of tube socket V1 (S-2). This end of the wire should be placed under the wires already running to the tube socket. Route the other end of this wire through grommet DD, then along the side of the dial mechanism, and over to the pilot lamp sockets. Leave the end free temporarily.

( ) Check all of the long wires just installed to see that they are dressed neatly down against the chassis and subpanel. Be sure the wires are routed as shown in Pictorial 5.

( ) R11. Connect the 10 KΩ 10 watt resistor from lug 6 of terminal strip A (NS) to lug 1 of tube socket V2 (S-1). Position the resistor body close to the terminal strip.

( ) Cut each lead of the NE-2 neon lamp to 3/4". Connect one lead to lug 1 (S-2) and the other lead to lug 2 (NS) of terminal strip A.

( ) Connect the free end of the bare wire coming from lug 2 of trimmer D to lug 4 of wafer A (S-2). Remember that lugs 4 and 6 are on the rear of this wafer.

( ) Connect the free end of the bare wire coming from lug 2 of trimmer E to lug 6 of wafer A (S-1).

NOTE: Remember to use the heavy bare wire in the following steps. Form each length to reach the terminating points called out in the step before making the connections. Do not crimp the ends of the wires on the switch lugs. Connections should be made to the coil lugs by forming a small hook in the end of each wire.

( ) Connect a 3-1/2" heavy bare wire from lug 2 of coil K (S-2) to lug 2 of wafer A (S-2).

( ) Connect the free end of the bare wire coming from lug 1 of trimmer D to the heavy bare wire just installed (S-1).

( ) Connect a 3" heavy bare wire from lug 2 of coil L (S-2) to lug 8 of wafer A (S-2).

( ) Connect a 3-1/2" heavy bare wire from lug 1 of coil K (S-2) to lug 1 of wafer B (S-2).

( ) Connect a 3-1/2" heavy bare wire from lug 2 of the variable capacitor (NS) to lug 9 of wafer A (S-1).

( ) Connect a 2-1/4" heavy bare wire from lug 1 of the variable capacitor (S-1) to lug 10 of wafer A (S-1).

( ) Connect a 2-1/2" heavy bare wire from lug 1 of coil L (NS) to lug 3 of wafer B (S-2).

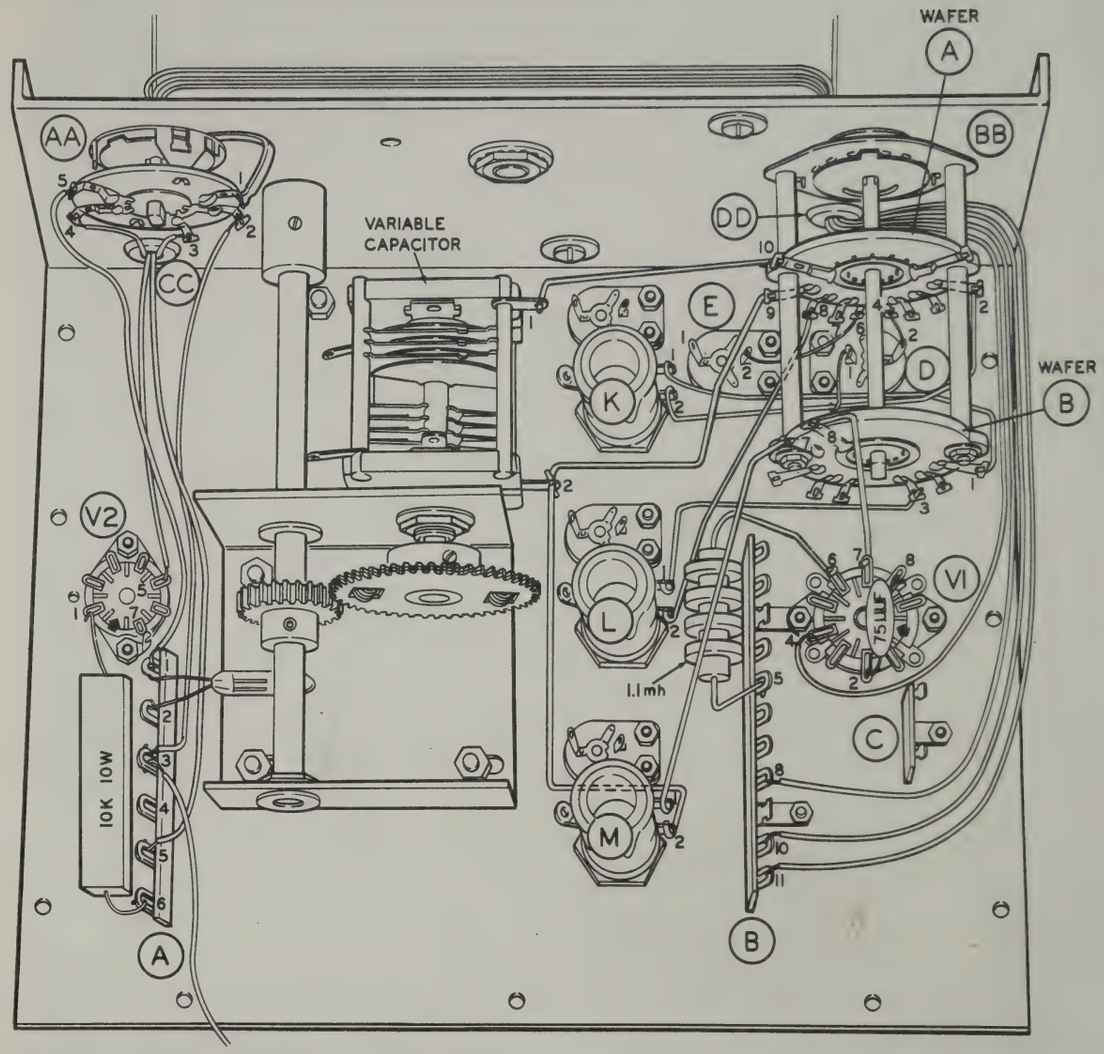
( ) Connect a 3-3/8" heavy bare wire from lug 1 of coil M (NS) to lug 7 of wafer B (S-1).

( ) Connect a 3" heavy bare wire from lug 7 of tube socket V1 (S-3) to lug 8 of wafer B (S-1).

( ) Hook one end of a 3-3/4" heavy bare wire over lug 2 of the variable capacitor (S-2).

( ) Form this wire as shown in the Pictorial and connect the free end to lug 2 of coil M (S-2). Make sure this wire does not short to one of the trimmer connections or to the antibacklash gear.

This completes all wiring steps that use the heavy bare wire.

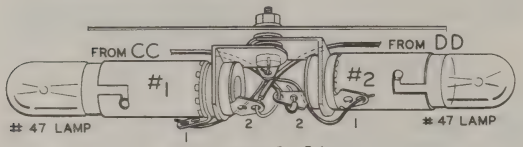


Pictorial 5

PILOT LAMP WIRING

Refer to Detail 6A for the following steps.

( ) Position the VFO so the pilot lamp sockets are accessible and bend the lugs of the sockets as shown.



Detail 6A

NOTE: In the following steps, do not drop hot solder on the dial drum.

( ) Connect a bare wire from lug 1 of the left socket (S-1) to the ground solder lug (NS).

( ) Connect another bare wire from lug 1 of the right socket (S-1) to the ground solder lug (S-2).

( ) Locate the two hookup wires; one coming from grommet CC and the other from grommet DD. Strip an additional 1/2" of insulation from one of these wires and connect the end through lug 2 of socket #1 (S-2) to lug 2 of socket #2 (NS).

( ) Connect the free end of the other hookup wire to lug 2 of socket #2 (S-2).

( ) Install a #47 lamp in each socket.

FINAL CHASSIS ASSEMBLY AND WIRING

Refer to Pictorial 6 for the following steps.

( ) Position the chassis base against the bottom of the chassis and fasten it in place with nine 6-32 x 1/4" screws, #6 lockwashers, and 6-32 nuts. The screws should be placed through the chassis and chassis base, and then secured with lockwashers and nuts. Be very careful not to damage any of the components mounted on the chassis or to pinch the wires running along the edge of the chassis.

( ) Fasten the sides of the chassis base to the edges of the subpanel. Use four 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

( ) Tighten the screws used to mount the dial mechanism to the chassis, checking to see that all shafts in the dial mechanism and tuning capacitor assembly turn freely.

( ) Now solder lug 1 of coil L (S-2) and lug 1 of coil M (S-2).

( ) Mount the four 1/2" shouldered spacers on the outside of the chassis base. Use a 6-32 x 3/8" screw and two #6 lockwashers for each spacer, one inside, and one outside the chassis.

( ) Mount 3-lug terminal strip EE inside the chassis base. Use a 6-32 x 1/4" screw, two #6 lockwashers, and a 6-32 nut.

( ) Mount phono socket FF with two 6-32 x 1/4" screws, #6 lockwashers, and 6-32 nuts. Orient this socket with its lugs as shown.

( ) Mount phone (key) jack GG with a control lockwasher, control flat washer, and control nut. Orient as shown.

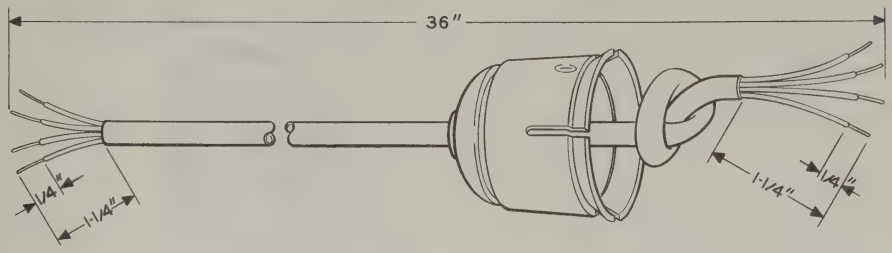
( ) Connect the free end of the bare wire coming from lug 1 of tube socket V1 to lug 3 of terminal strip EE (NS).

( ) R 6. Connect a 10 KΩ (brown-black-orange) 1/2 watt resistor between lugs 1 (NS) and 2 (NS) of terminal strip EE.

( ) C31. Connect a .001 μfd disc ceramic capacitor between lugs 1 (NS) and 2 (S-2) of terminal strip EE.

( ) R5. Connect a 2200 Ω (red-red-red) 1/2 watt resistor between lugs 1 (S-3) and 3 (NS) of terminal strip EE.

( ) C30. Connect a 100 μμf mica capacitor from lug 3 of terminal strip EE (S-3) to lug 1 of phono socket FF (S-1).



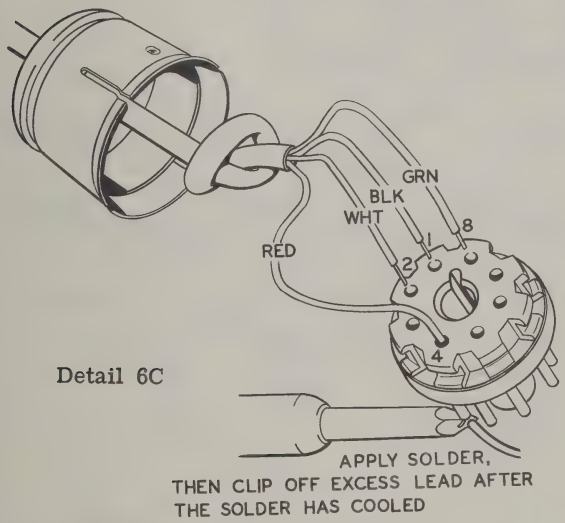
Detail 6B

( ) Connect a short bare wire between lugs 2 (S-1) and 3 (S-1) of jack GG.

( ) Connect the free end of the hookup wire coming from lug 3 of terminal strip A to lug 1 of jack GG (S-1).

( ) Prepare each end of the 3-foot length of 4-conductor cable as shown in Detail 6B.

( ) Attach the octal plug and plug cap to one end of this cable as shown in Detail 6C.



Detail 6C

( ) Snap the plug cap over the plug, making sure the cap seats firmly.

( ) Insert the other end of this cable through hole HH of the chassis base.

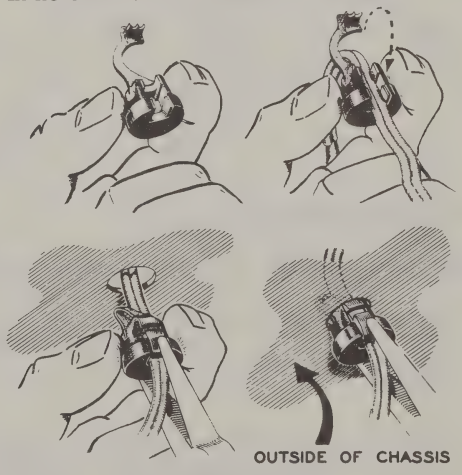
( ) Connect the red wire to lug 6 of terminal strip A (S-2).

( ) Connect the white wire to lug 5 of terminal strip A (S-2).

( ) Connect the black wire to lug 4 of terminal strip A (S-1).

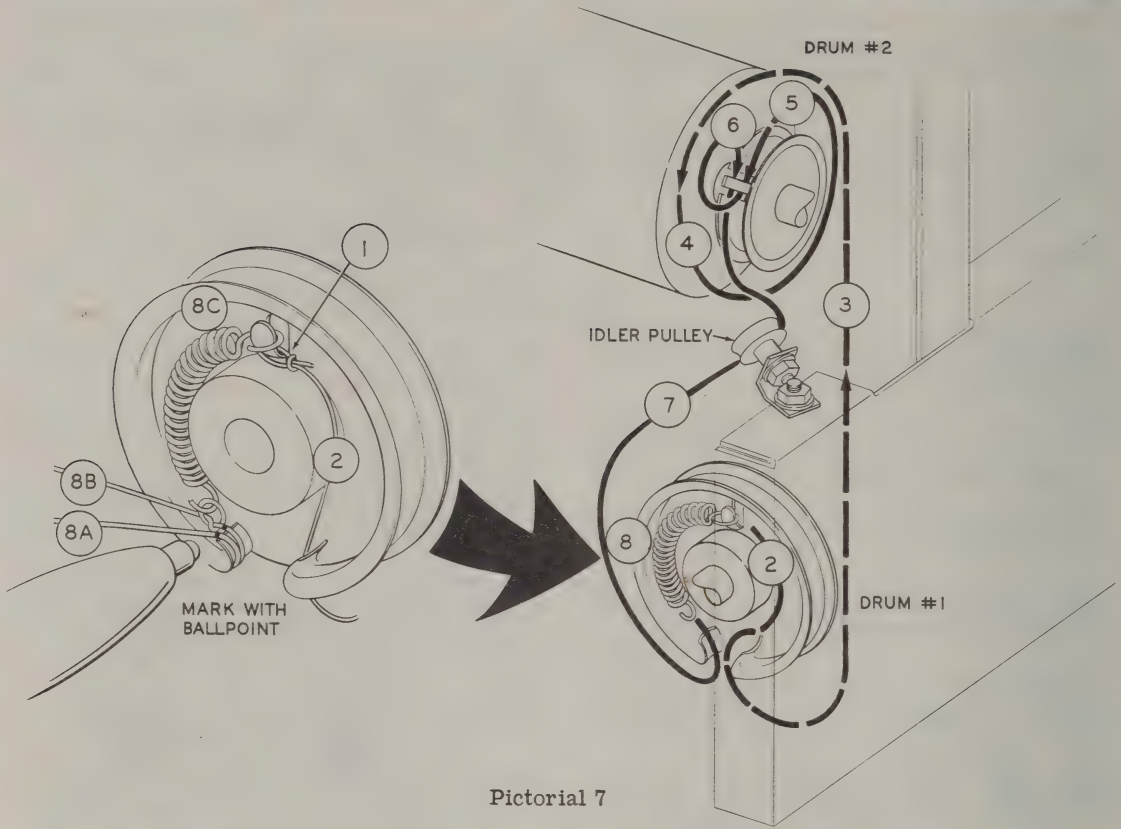
( ) Connect the green wire to lug 2 of terminal strip A (S-2).

( ) Referring to Detail 6D, install the plastic strain relief around the 4-conductor cable in hole HH of the chassis base.



Detail 6D

This completes the wiring of the VFO. Check to see that all connections are soldered securely and that there are no short circuits caused by wire clippings, solder splashes, or improper lead dress. In particular, check the heavy bare wires running to switch BB. All hookup wires should be dressed against the chassis.



Pictorial 7

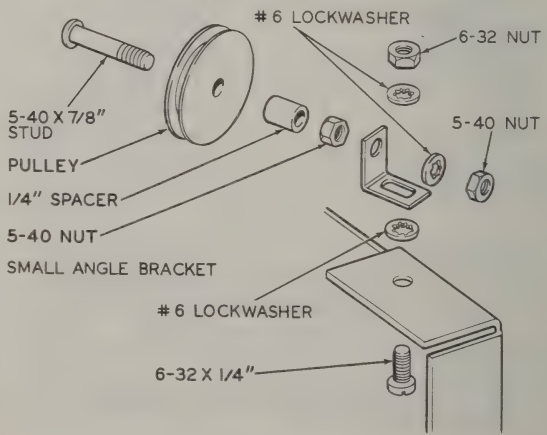
DIAL DRIVE ASSEMBLY

Refer to Detail 7A for the following steps.

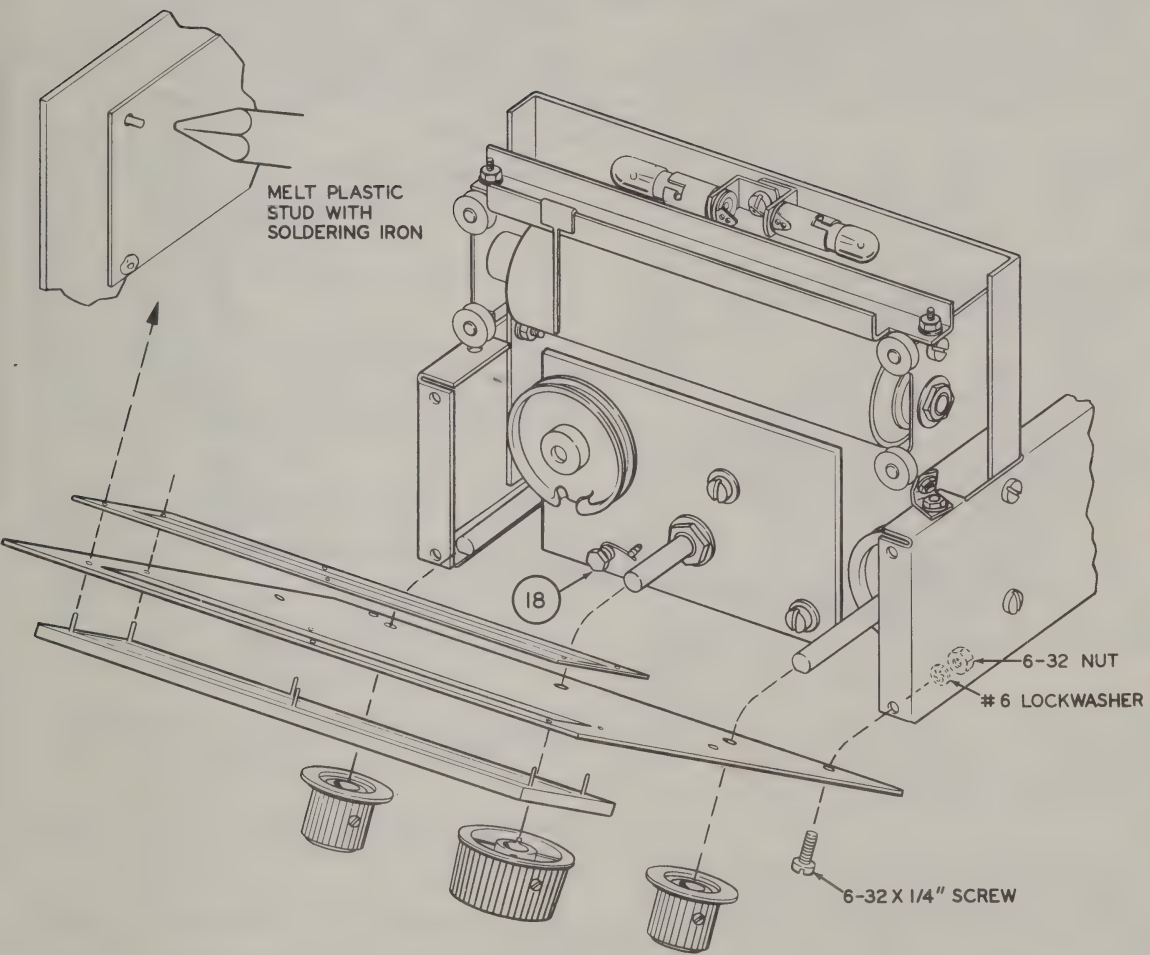
( ) Mount the idler pulley and the 1/4" spacer on the 5-40 x 7/8" stud as shown. Next, tighten a 5-40 nut as far as it will go onto the stud.

( ) Mount the stud, with the idler pulley, on the small angle bracket as shown, and fasten it with a #6 lockwasher and a 5-40 nut.

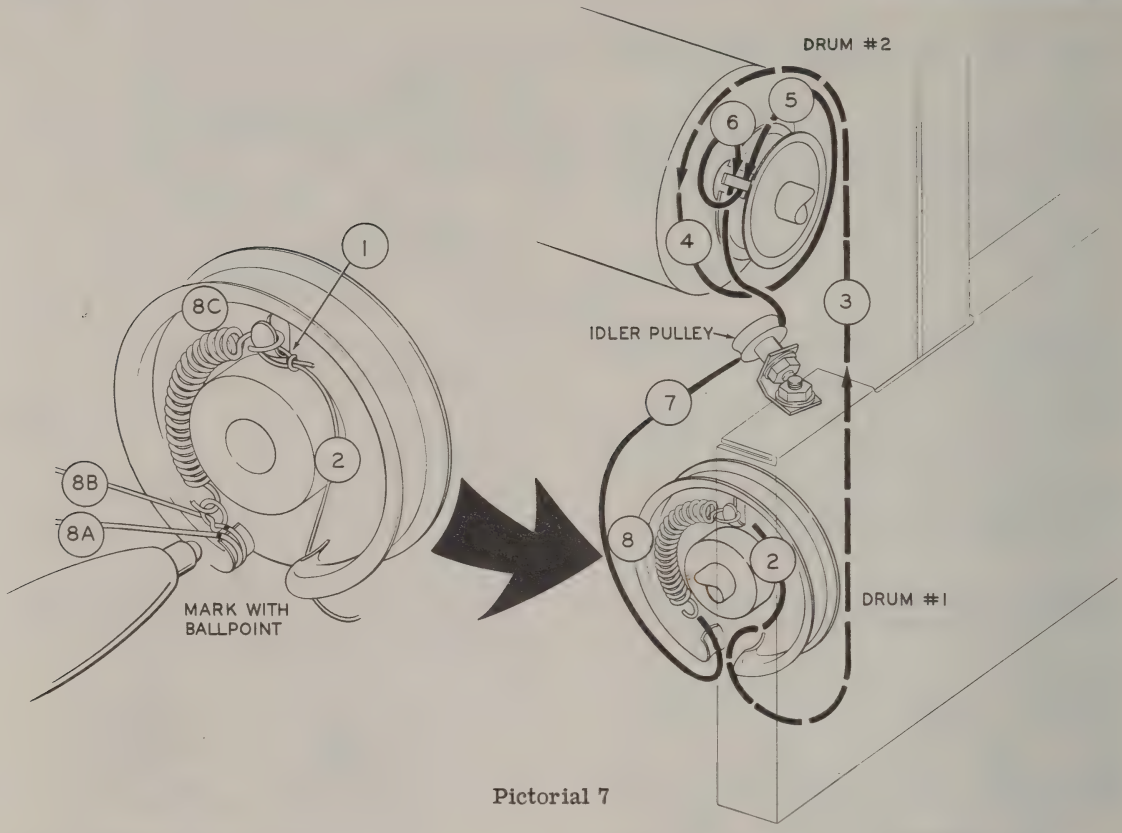
( ) Mount the angle bracket on the upper flange of the chassis base in the position shown in Pictorial 7. Use a 6-32 x 1/4" screw, two #6 lockwashers, and a 6-32 nut as shown in Detail 7A.



Detail 7A


MELT PLASTIC
STUD WITH
SOLDERING IRON
18
6-32 NUT
6 LOCKWASHER
6-32 X 1/4" SCREW

Pictorial 9



Pictorial 7

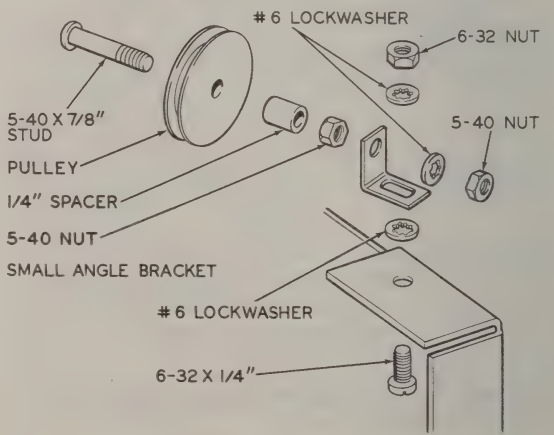
DIAL DRIVE ASSEMBLY

Refer to Detail 7A for the following steps.

( ) Mount the idler pulley and the 1/4" spacer on the 5-40 x 7/8" stud as shown. Next, tighten a 5-40 nut as far as it will go onto the stud.

( ) Mount the stud, with the idler pulley, on the small angle bracket as shown, and fasten it with a #6 lockwasher and a 5-40 nut.

( ) Mount the angle bracket on the upper flange of the chassis base in the position shown in Pictorial 7. Use a 6-32 x 1/4" screw, two #6 lockwashers, and a 6-32 nut as shown in Detail 7A.



Detail 7A

( ) Bend the angle bracket by pushing upward until the pulley is tilted upward, as it appears in Pictorial 7.

Refer to the proper circled number in Pictorial 7 for each of the following steps.

(1) ( ) Turn the BAND switch shaft counterclockwise so the dial cord drum is in the position shown in Pictorial 7. Cut a 19" length of dial cord and tie a loop in one end of it. Fasten this loop around the tab in dial cord drum #1.

(2) (3) ( ) Route the other end of the cord out through the opening in the dial cord drum, and up behind drum #2.

(4) ( ) Route the dial cord completely around drum #2.

(5) (6) ( ) Turn drum #2 so that the slot faces toward you, as it is shown. Insert the dial cord through the rear opening in the slot first and wrap it around the tab as shown.

(7) ( ) Route the dial cord down behind the idler pulley and around the side of dial cord drum #1 to the opening.

(8A) ( ) Hold the dial cord so the string is tight as shown in 8A, and make a mark on the string with a ballpoint pen about 1/8" from the opening.

(8B) ( ) Tie the dial cord spring to the dial cord at the point just beyond the mark made by the ballpoint pen.

(8C) ( ) Stretch the spring out and connect the other end to the tab of dial cord drum #1.

Refer to Pictorial 8 for the following steps.

( ) Mount the dial pointer bracket on the spade bolts of the dial drum supports with #6 lockwashers and 6-32 nuts. It may be necessary to loosen the dial drum support mounting screws for this step. If so, be sure to retighten them when the step is completed, then make sure that the dial cylinder still rotates freely.

(1) ( ) With the shaft of the FREQUENCY control turned to the fully counterclockwise position, adjust the large dial cord drum to the position shown in Pictorial 8 by loosening and then retightening the setscrew. Tie a loop in one end of the remaining length of dial cord and fasten the loop around the correct tab of the large dial cord drum.

(2) (3) ( ) Route the dial cord out through the opening, and one complete turn around the outside of the drum.

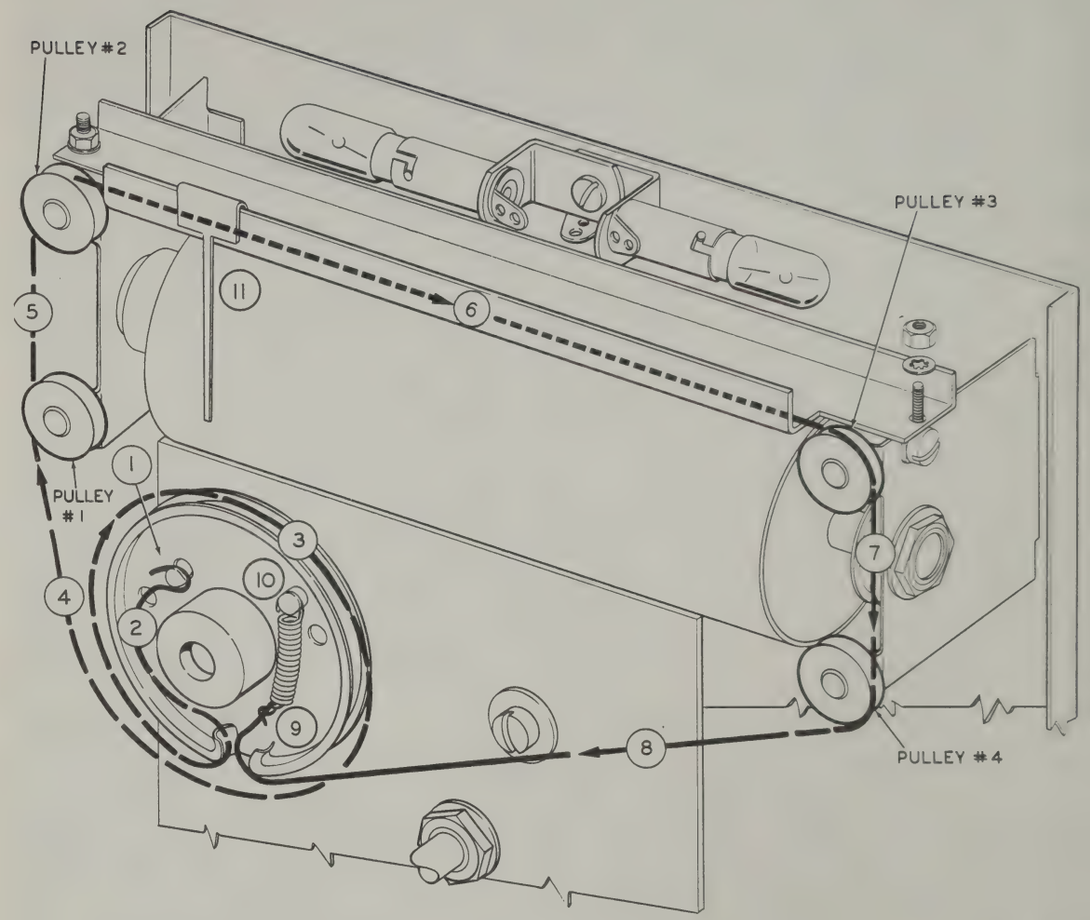
(4) (5) (6) ( ) Route the dial cord around pulley #1 and pulley #2, and across the top of the dial pointer bracket.

(7) (8) ( ) Route the dial cord around pulleys #3 and #4, and back through the opening of the large dial cord drum.

(9) ( ) Hold the dial cord so the string is tight and make a mark with a ballpoint pen on the string about 1/4" inside the drum opening. Refer back to 8A on Pictorial 7.

(10) ( ) Tie the dial cord spring to the dial cord at the point just beyond the mark made by the ballpoint pen. Stretch the opening and connect the other end of it to the tab.

(11) ( ) Mount the dial pointer on the dial pointer bracket. Place the dial cord between the tabs on the pointer. Press the tabs together loosely so that the pointer will stay connected to the cord, but so that its position can be easily adjusted to the correct location later. Make sure the pointer does not rub on the dial cylinder.



Pictorial 8

FINAL ASSEMBLY

Refer to Pictorial 9 for the following steps.

(√) Install the dial window on the lettered side of the front panel by inserting the six plastic studs through the small holes around the dial window opening.

(√) Place the dial plate (205-315-2) over the plastic studs on the back side of the front panel with the painted side toward the front panel. Fasten the dial window and dial plate to the front panel by melting down the six plastic studs as shown.

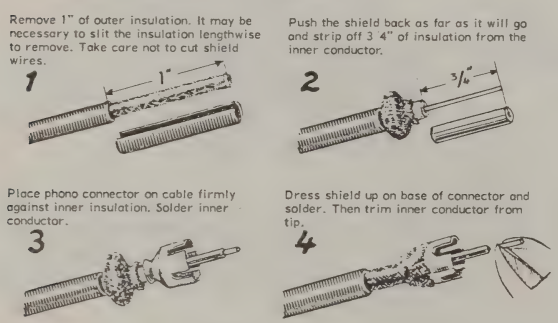
(√) Fasten the front panel to the chassis assembly with 6-32 x 1/4" screws, #6 lockwashers, and 6-32 nuts in the four mounting holes.

(√) Install an 8-32 x 3/8" setscrew in the large knob. Then install the large knob on the shaft of the FREQUENCY control.

(√) Install an 8-32 x 1/4" setscrew in each of the small knobs.

(√) Install small knobs on the shafts of the FUNCTION switch and BAND switch.

( ) Prepare the length of RG-62/U coax cable by installing a phono plug on each end as shown in Detail 9A. Set this prepared cable aside until it is called for in the Installation section of the manual.


Remove 1" of outer insulation. It may be necessary to slit the insulation lengthwise to remove. Take care not to cut shield wires.
1
1"
Push the shield back as far as it will go and strip off 3 4" of insulation from the inner conductor.
2
3/4"
Place phono connector on cable firmly against inner insulation. Solder inner conductor.
3
Dress shield up on base of connector and solder. Then trim inner conductor from tip.
4

Detail 9A

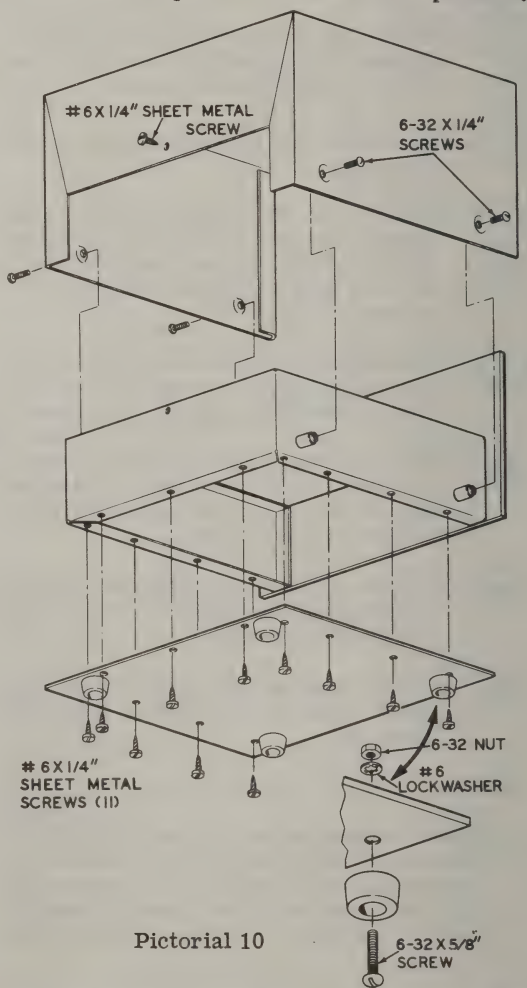
Refer to Pictorial 10 for the following step.

( ) Mount the four rubber feet to the bottom plate. Use 6-32 x 1/2" screws, #6 lockwashers, and 6-32 nuts as shown in the Detail of Pictorial 10. Be sure to use the correct hole at each corner of the bottom plate.

NOTE: The blue and white identification label shows the Model Number and Production Series Number of your kit. Refer to these numbers in any communications with the Heath Company; this assures you that you will receive the most complete and up-to-date information in return.

( ) Install the identification label in the following manner:

1. Select a location for the label where it can easily be seen when needed, but will not show when the unit is in operation. This location might be on the rear panel or the top of the chassis, or on the rear or bottom of the cabinet.
2. Carefully peel away the backing paper. Then press the label into position.



Pictorial 10

Set the bottom plate aside temporarily. The bottom plate, cabinet, and tubes will be installed later.

INSTALLATION

This part of the manual is divided into the following three sections to cover the different types of VFO installations:

1. Use with the Heathkit DX-60 series Transmitters or HW-16 Transceiver.
2. Use with the Heathkit DX-40 Transmitter.
3. Use with other transmitters, having suitable VFO input and VFO operating voltage provisions or, having a VFO input but no provisions for furnishing operating voltages to the VFO.

Use only the section which applies to your particular installation of the VFO.

HEATHKIT DX-60 SERIES OR HW-16

Connect the octal plug of the VFO power cable to the accessory socket of the transmitter, and connect the prepared coaxial cable from the VFO output socket to the transmitter's VFO INPUT. Be sure to turn the front panel XTAL switch to VFO and turn the DRIVE LEVEL control to "0" while checking VFO calibration.

Now proceed to the VFO Calibration section of the manual.

HEATHKIT DX-40

It is necessary to make three simple circuit changes in the VFO in order to use it with the DX-40 Transmitter. Make these changes as follows:

( ) Locate the resistor connected to lug 4 of the accessory socket in the DX-40. Replace this resistor with a 10 KΩ 10 watt resistor, obtained locally.

( ) Disconnect the green wire of the power cable from lug 2 of terminal strip A, then reconnect this wire to lug 3 of terminal strip A. See Figure 1.

( ) Clip out the bare wire connected between lugs 2 and 3 of the KEY jack. See Figure 1.

The VFO is now ready for use with the DX-40 Transmitter. Connect the octal plug of the VFO power cable to the accessory socket of the DX-40. Connect the prepared coax cable from the VFO output socket to the VFO input of the DX-40.

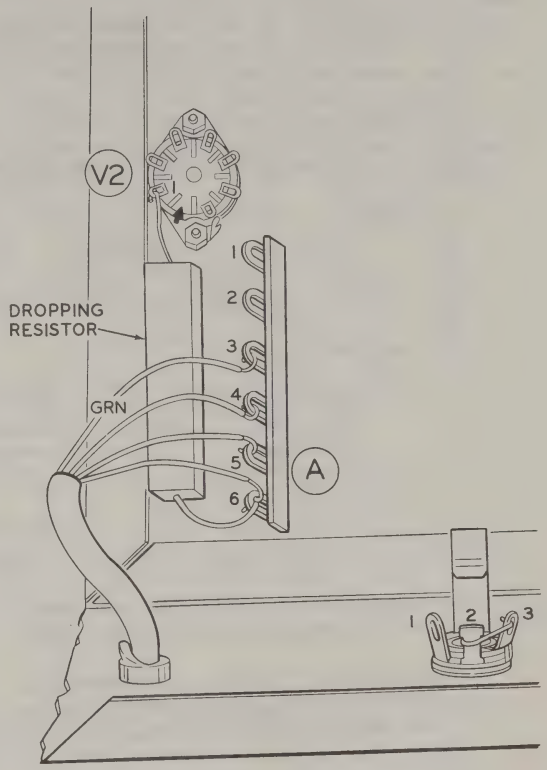


Figure 1

Proceed to VFO Calibration section of the manual.

OTHER TRANSMITTERS

Depending on your particular transmitter, it may be necessary to make one or more circuit changes in the VFO. These possible circuit changes concern "Keying" and "Supply Voltage." Each of the items should be handled separately, as follows:

KEYING

If your transmitter provides a grid block keying signal (-65 volts or more) it will not be necessary to change the VFO keying circuit. The grid block keying signal is applied to the VFO through the green wire of the power cable, which is connected to pin 8 of the octal plug.

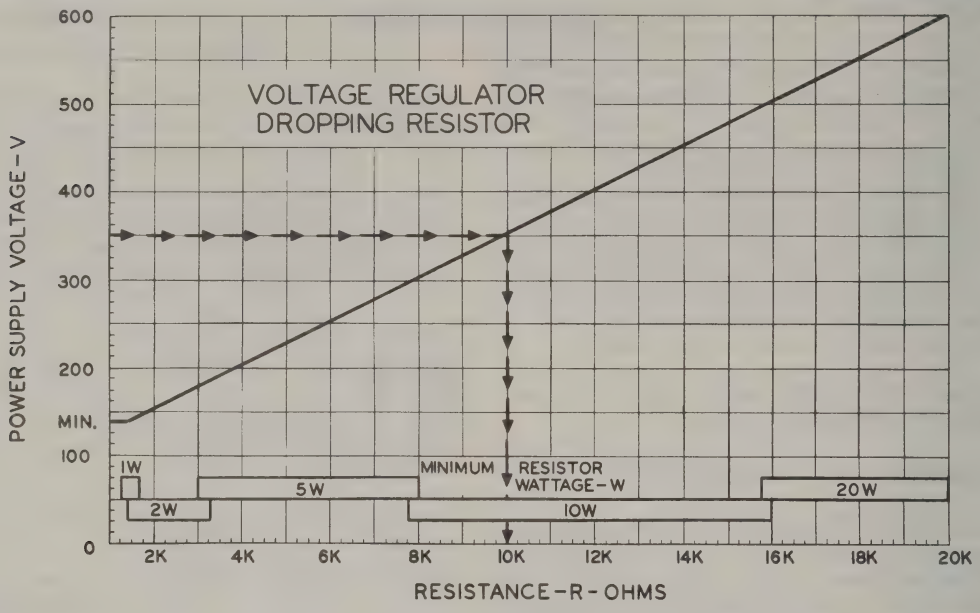


Figure 2

For cathode keying of the VFO, it is necessary to make the following changes in the VFO.

( ) Referring to Figure 1, disconnect the green wire of the power cable from lug 2 of terminal strip A, then reconnect this wire to lug 3 of terminal strip A.

( ) Clip out the bare wire connected between lugs 2 and 3 of the KEY jack if the key is to be plugged into the transmitter.

The VFO is now ready for cathode keying. The key may be connected to the VFO KEY jack or to the transmitter. If the key is connected to the transmitter, the keying connection to the VFO is made through pin 8 and the green wire of the VFO power cable.

SUPPLY VOLTAGE

The value of the B+ voltage applied to the voltage regulator tube in the VFO is critical. For this reason, the value of the Dropping Resistor in series with the VR tube must be chosen to provide the correct voltage. The chart in Figure 2 should be used to determine the correct resistance and wattage of the Dropping Resistor. For example: If the B+ available from the transmitter is 350 volts, draw a line from the 350 volt point on the vertical scale across to the diagonal line of the graph. Then draw a line down from the point of intersection, to the horizontal scale. The point at which this line crosses the horizontal scale indicates the resistance value and wattage for the Dropping Resistor. This example is shown by the line of arrows on Figure 2. Do not use smaller resistance or wattage values. The correct Dropping Resistor should be installed in the VFO as shown in Figure 1. The 10 KΩ, 10 watt resistor, already in the VFO, should be removed. Figure 3 shows the VR tube and Dropping Resistor circuit schematically.

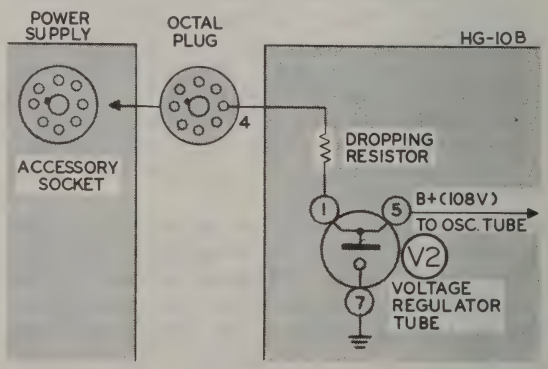


Figure 3

Filament voltage of 6.3 volts AC should be applied to the VFO through pin 2 of the octal plug and the white wire of the power cable. Pin 1 and the black wire are used for the ground connection between the VFO and the transmitter.

If your transmitter cannot be used to supply operating voltages to the VFO, you may choose to build a separate power supply for the VFO. The circuit of a suitable power supply is shown in Figure 4. Parts for the power supply should be obtained locally. If a separate power supply is used, be sure to use the correct value of dropping resistor in the VFO, depending on the B+ voltage available from the power supply. The octal plug from the VFO can be connected to the power supply, but separate keying and ground connections will be needed between the power supply and the transmitter.

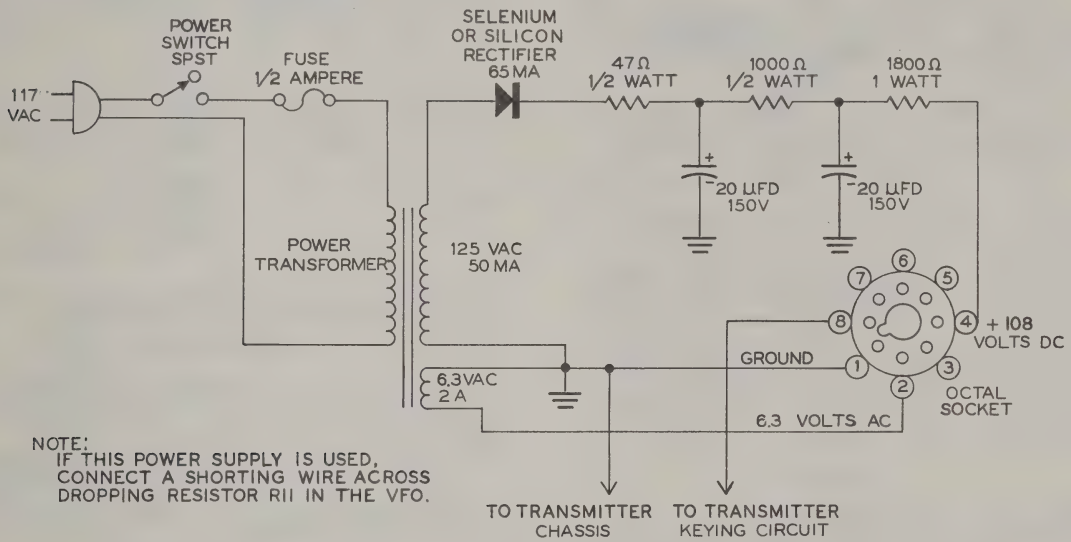

POWER SWITCH SPST
FUSE 1/2 AMPERE
117 VAC
SELENIUM OR SILICON RECTIFIER 65 MA
47 Ω 1/2 WATT
1000 Ω 1/2 WATT
1800 Ω 1 WATT
20 µFD 150V
20 µFD 150V
POWER TRANSFORMER
125 VAC 50 MA
6.3 VAC 2 A
GROUND
6.3 VOLTS AC
+ 108 VOLTS DC
OCTAL SOCKET
NOTE: IF THIS POWER SUPPLY IS USED, CONNECT A SHORTING WIRE ACROSS DROPPING RESISTOR R11 IN THE VFO.
TO TRANSMITTER CHASSIS
TO TRANSMITTER KEYING CIRCUIT

Figure 4

VFO CALIBRATION

DIAL INDICATOR

(✓) Loosen the 6-32 screw that is used as a setscrew in the bushing of the dial cylinder. Next, set the BAND switch to the 80 meter position, then position the dial cylinder so that the 80 meter scale is centered, looking through the dial window from the front of the VFO. Tighten the setscrew in the dial indicator bushing.

(✓) Rotate the BAND switch through its positions. In each position, the corresponding dial scale should be centered, looking through the dial window. If the scales are not centered in the dial window opening, repeat the preceding step.

DIAL POINTER

(✓) With the BAND switch in the 80 meter position, rotate the FREQUENCY knob clockwise until you feel the mechanism reach the upper mechanical stop.

(✓) Position the dial pointer 1/16" to the right of 4.0 on the scale, then secure the pointer on the dial cord by bending the fingers of the pointer. Be careful not to cut the dial cord.

(✓) Rotate the FREQUENCY knob counterclockwise and see that the dial pointer travels smoothly.

VARIABLE CAPACITOR

( ) Loosen the setscrew in the small brass gear of the variable capacitor assembly. Refer to Figure 5.

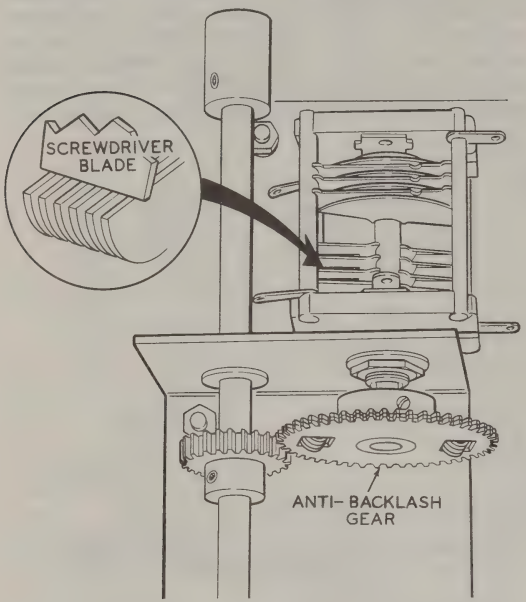


Figure 5

( ) Rotate the FREQUENCY knob counter-clockwise until you feel the mechanism reach the lower mechanical stop. NOTE: This stop is spring loaded and the shaft will slip if the FREQUENCY knob is turned farther.

( ) While holding the FREQUENCY knob at the lower mechanical limit, turn the anti-backlash gear by hand until the plates of the variable capacitor are meshed. The plates are properly meshed when the edges are flush at the point shown in Figure 5. The end of a screwdriver blade can be used to check for proper mesh at this point. Retighten the setscrew in the small brass gear.

( ) The VFO bottom plate should be installed now, using eleven #6 x 1/4" sheet metal screws. See Pictorial 10 on Page 26.

PRESET ADJUSTMENTS

Refer to Figure 6 for the following steps.

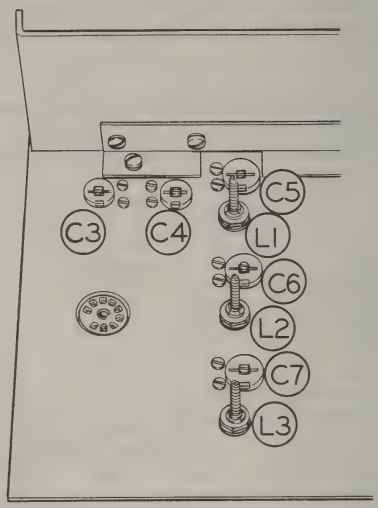


Figure 6

( ) Set each trimmer capacitor (C3 through C7) so that the slot is parallel to the front panel.

( ) Preset each coil as follows, measuring from the tip of the coil adjustment screw to the point where the screw leaves the coil mounting bushing.

COIL	DIMENSION
L1	1"
L2	7/8"
L3	7/8"

TRIMMER COIL ADJUSTMENTS

To calibrate the VFO, it will be necessary to use an accurate radio receiver that covers 3.5 to 9 megacycles. For best results, use a crystal calibrator with the receiver to assure setting the receiver dial to the exact frequencies called for. The VFO adjustments should be made with an insulated alignment tool.

Before proceeding with calibration, install the two tubes in the VFO: V1 = 6CH8, V2 = OB2.

After the tubes are installed, take care not to damage the tubes by setting the VFO upside down. Connect the power cable of the VFO to your transmitter as directed in the Installation section of the manual; then turn on both units and allow the VFO to warm up for at least thirty minutes. The coax cable need not be connected between the VFO and transmitter during calibration.

When making the following adjustments, the VFO should be placed next to the receiver so the receiver will pick up the signal radiated from the VFO.

NOTE: The trimmer capacitors may drift slightly for several minutes after they are adjusted, therefore, go through the calibration slowly.

Refer to Figure 6 for the following steps.

80 METERS

( ) Turn the FUNCTION switch to the SPOT position and the BAND switch to the 80 meter position. Set the VFO dial pointer to 3.5.

( ) Tune in the VFO signal near 3.5 mc on the receiver. Then adjust coil L3 to bring the signal to exactly 3.5 mc.

( ) Set the VFO dial to 4 and tune in this signal with the receiver. If the signal is not exactly at 4 mc, proceed as follows:

1. If the signal is lower than 4 mc, set the VFO dial a few kc above the bottom of the band (try 3510) and turn the receiver to 3.5 mc. Adjust coil L3 for zero beat in the receiver. Next, set the VFO dial to 3.5 and adjust trimmer C7 for zero beat. Check the VFO against the receiver at 4 mc. Repeat this procedure as necessary until the VFO provides a 4 mc signal with the dial set at 4 and a 3.5 mc signal with the dial set at 3.5.

2. If the signal was higher than 4 mc, set the VFO dial to 3.5 and turn the receiver a few kc above the bottom of the band (try 3510). Adjust coil L3 for zero beat in the receiver. Turn the receiver to 3.5 mc and adjust trimmer C7 for zero beat. Check the VFO against the receiver at 4 mc. Repeat this procedure until the VFO provides a 4 mc signal with the dial set at 4 and a 3.5 mc signal with the dial set at 3.5.

40-20-15-10 METERS

( ) Leave the FUNCTION switch in the SPOT position and turn the BAND switch to the 40 meter position. Set the VFO dial pointer to 7.

( ) Tune in the VFO signal near 7 mc on the receiver, then adjust coil L2 to bring the signal to exactly 7 mc.

( ) Set the VFO dial to 7.3 and tune in the signal with your receiver. If the signal is not exactly at 7.3 mc, proceed as follows:

1. If the signal was lower than 7.3 mc, set the VFO dial a few kc above the bottom of the band (try 7010) and turn the receiver to 7 mc. Adjust coil L2 for zero beat in the receiver. Next, set the VFO dial to 7 and adjust trimmer C6 for zero beat. Check the VFO against the receiver at 7.3 mc. Repeat this procedure as necessary until the VFO provides a 7.3 mc signal with the dial set at 7.3 and a 7 mc signal with the dial set at 7.

2. If the signal was higher than 7.3 mc, set the VFO dial to 7 and turn the receiver a few kc above the bottom of the band (try 7010). Adjust coil L2 for zero beat in the receiver. Turn the receiver to 7 mc and adjust trimmer C6 for zero beat. Check the VFO against the receiver at 7.3 mc. Repeat the procedure until the VFO provides a 7.3 mc signal with the dial set at 7.3 and a 7 mc signal with the dial set at 7.

The above adjustments cover the 20, 15, and 10 meter bands as well as the 40 meter band since all of these bands use multiples of the 7 mc band signals.

6 METERS

Leave the FUNCTION switch in the SPOT position and set the BAND switch to the 6 meter position. Set the VFO dial pointer to 50.4.

( ) Tune in the VFO signal near 8.4 mc on the receiver, then adjust coil L1 to bring the signal to exactly 8.4 mc as tuned on the receiver.

( ) Set the VFO dial to 54 and tune in this signal near 9 mc with your receiver. If the signal is not exactly at 9 mc, proceed as follows:

1. If the signal was lower than 9 mc, set the VFO dial a few kc above 50.4 and turn the receiver to 8.4 mc. Adjust coil L1 for zero beat in the receiver. Next, set the VFO dial to 50.4 and adjust trimmer C5 for zero beat. Check the VFO setting at 54 against the receiver at 9 mc. Repeat this procedure as necessary until the VFO provides a 9 mc signal with the dial set at 54 and an 8.4 mc signal with the dial set at 50.4.

2. If the signal was higher than 9 mc, set the VFO dial to 50.4 and turn the receiver a few kc above 8.4 mc. Adjust coil L1 for zero beat in the receiver. Turn the receiver to 8.4 mc and adjust trimmer C5 for zero beat. Check the VFO setting at 54 against the receiver at 9 mc. Repeat this procedure until the VFO provides a 9 mc signal with the dial set at 54 and an 8.4 mc signal with the dial set at 50.4.

NOTE: If an 8.33 to 9 mc receiver is not available, a 6 meter receiver can be used, aligning at 50 and 54 mc.

2 METERS

( ) Leave the FUNCTION switch in the SPOT position and set the BAND switch to the 2 meter position. Set the VFO dial pointer to 144.

( ) Tune in the VFO signal near 8 mc on the receiver. Adjust trimmer C3 until the signal is exactly 8 mc. Then set the VFO dial to 147.6 and tune in this signal near 8.2 mc on the receiver. Adjust trimmer C4 for a signal at exactly 8.2 mc.

( ) Repeat the above two adjustments until an output signal of 8 mc is obtained with the VFO dial set at 144 and a signal of 8.2 mc is obtained with the VFO dial set at 147.6.

NOTE: A 2 meter receiver can be used if an 8-8.222 receiver is not available, using 144 and 148 mc as alignment points.

( ) Recheck the 6 and 2 meter calibration for accuracy.

This completes the calibration of your VFO. Install the cabinet with the screws shown in Pictorial 10 on Page 26.

NOTE: It will be noted that bands 40, 20, 15, and 10 do not have their calibrations in exact alignment with each other. This is due to the slight changes in lead length in the band switch between bands, and causes no harm.

OPERATION

By means of the FUNCTION switch, the VFO may be controlled independently of the transmitter or controlled by the transmitter. With the key up, the VFO should be operated alone for tuning purposes by turning to SPOT. It is bad operating procedure to tune a VFO across the band with the entire transmitter following it. This causes needless interference to other stations. The VFO alone should be set to the desired frequency. Then quickly tune the transmitter to resonance at the frequency. This procedure produces far less interference.

Crowding the band edges is not recommended unless a positive and constant check upon frequency is maintained, particularly with a phone transmitter where the sidebands may run three or more kc over and under the base frequency. Even a single sideband transmitter can put some hash on the undesired sideband and create signals outside of the amateur band.

Refer to the operating directions for your transmitter which concern use of the transmitter with a VFO.

NOTE: The VFO may be keyed any time by using a key in its key jack, provided proper voltages are supplied to it. This feature is useful for testing keyers or for code practice, and for use with transmitters which will work when just the VFO input is keyed.

NOTE: The transmitter FUNCTION SWITCH must be in the TUNE position when using the VFO in SPOT in order to supply B+ voltage to the VFO.

IN CASE OF DIFFICULTY

CAUTION: Do not set the VFO upside down without the cabinet installed, as the only support would be the tubes which could be damaged.

1. Recheck the wiring. Trace each lead in colored pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something consistently overlooked by the constructor.

2. It is interesting to note that about 90% of the kits that are returned for repair, do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by reheating all connections to make sure that they are soldered as described in the Proper Soldering Techniques section of this manual.

3. Check to be sure that all tubes are in their proper locations. Make sure that all tubes light up properly.

4. Check the tubes with a tube tester or by substitution of tubes of the same types and known to be good.

5. Check the values of the component parts. Be sure that the proper part has been wired into the circuit, as shown in the pictorial diagrams and as called out in the wiring instructions.

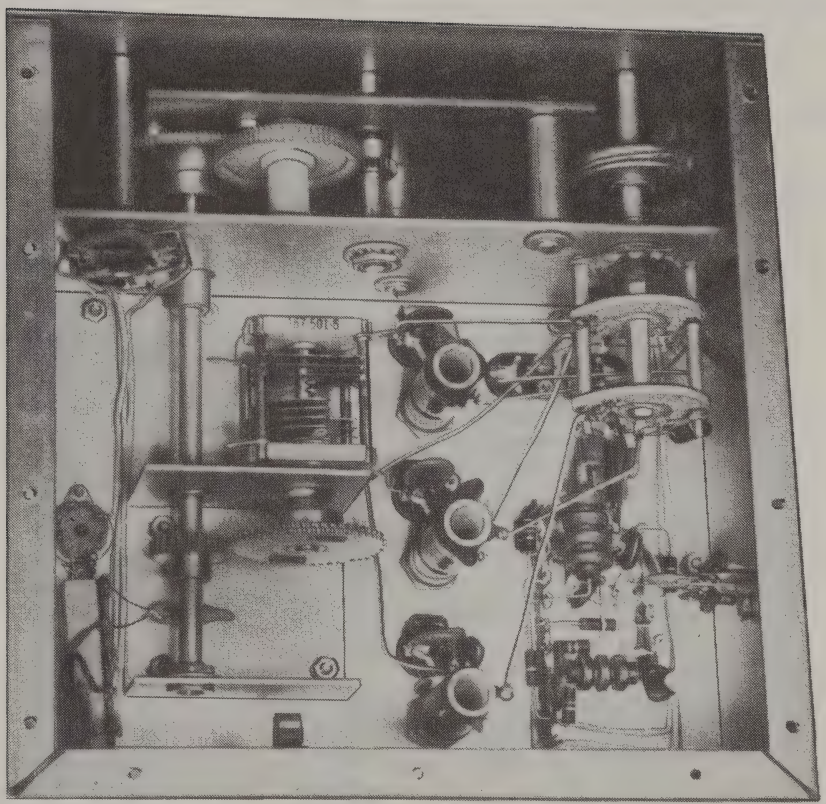
6. Check for bits of solder, wire ends or other foreign matter which may be lodged in the wiring beneath the chassis.

7. If, after careful checks, the trouble is still not located and a voltmeter is available, check voltage readings against those found on the Schematic Diagram. NOTE: All voltage readings were taken with an 11 megohm input vacuum tube voltmeter. Voltages may vary as much as 10% due to line voltage variations.

8. A review of the Circuit Description will prove helpful in indicating where to look for trouble.

TROUBLESHOOTING CHART	
TROUBLE	POSSIBLE CAUSE
No Output	1. Faulty tube. 2. Open key in KEY jack. 3. RF output cable open or shorted.
Low Output	1. Low B+ voltage. 2. RF output cable too long. 3. Transmitter VFO input impedance too low.
Instability	1. Low B+ voltage, below 108 V DC. 2. VR tube faulty. 3. Key contacts dirty (for cathode keying only).
Oscillator continues to run with key up (grid block keying only).	1. Transmitter is not furnishing negative grid block keying voltage to VFO; should be -65 V DC or more - enough to light the neon bulb. 2. Green wire of power cable open.

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of the Manual. Your Warranty is located inside the front cover of the Manual.



REPLACEMENT PARTS PRICE LIST

To order parts, use the Parts Order Form furnished with this kit. If Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual.

PART No.	PRICE Each	DESCRIPTION
RESISTORS		
1-118	.15	82 Ω 1/2 watt
1-9	.15	1000 Ω 1/2 watt
1-44	.15	2200 Ω 1/2 watt
1-20	.15	10 KΩ 1/2 watt
1-22	.15	22 KΩ 1/2 watt
1-25	.15	47 KΩ 1/2 watt
1-27	.15	150 KΩ 1/2 watt
3-7-10	.50	10 KΩ 10 watt, wire-wound
CAPACITORS		
20-102	.25	100 μμf silver mica
20-108	.30	200 μμf silver mica
20-40	.30	470 μμf molded mica
20-107	.60	680 μμf silver mica
21-29	.25	4.7 μμf tubular ceramic (N750)
21-28	.25	10 μμf tubular ceramic (N750)
21-41	.20	14 μμf tubular ceramic
21-61	.15	6.8 μμf disc ceramic (NPO)
21-6	.15	27 μμf disc ceramic (NPO)
21-7	.15	33 μμf disc ceramic (N750)
21-40	.15	47 μμf disc ceramic (NPO)
21-85	.15	56 μμf disc ceramic (NPO)
21-86	.15	75 μμf disc ceramic (NPO)
21-140	.15	.001 μfd disc ceramic
21-57	.15	.005 μfd disc ceramic
26-52	10.62	2-section variable, 5-25 μμf per section
31-17	1.35	Trimmer, 5-25 μμf (NPO)
COILS		
40-329	3.95	VFO coil
40-381	3.95	VFO coil (80-Meter)
45-82	1.00	350 microhenry RF choke
45-4	1.00	1.1 millihenry RF choke
SWITCHES		
63-280	5.20	7-position, 2-section rotary
63-282	2.20	3-position, 1-section rotary
TUBES-LAMPS		
411-46	3.40	OB2 tube
411-159	5.00	6CH8 tube
412-1	.25	#47 lamp
412-11	.30	NE-2 neon lamp

PART No.	PRICE Each	DESCRIPTION
HARDWARE		
250-49	.05	3-48 x 1/4" screw
250-135	.15	5-40 x 5/16" hex head screw
250-120	.05	5-40 x 7/8" threaded stud
250-124	.05	6-32 x 3/16" screw
250-56	.05	6-32 x 1/4" screw
250-89	.05	6-32 x 3/8" screw
250-10	.05	6-32 x 1/2" screw
250-170	.05	#6 x 1/4" sheet metal screw
250-33	.05	6-32 x 1/8" setscrew
250-43	.05	8-32 x 1/4" setscrew, slotted head
250-1193	.05	8-32 x 3/8" setscrew
251-1	.05	6-32 spade bolt
252-1	.05	3-48 nut
252-40	.05	5-40 nut
252-3	.05	6-32 nut
252-7	.05	Control nut
253-10	.05	Control flat washer
253-11	.05	E washer
253-36	.05	Spring washer
253-39	.05	9/16" OD flat washer
253-42	.05	1/2" OD flat washer
254-7	.05	#3 lockwasher
254-1	.05	#6 lockwasher
254-4	.05	Control lockwasher
255-13	.05	1/4" spacer
255-16	.35	1-1/4" spacer (shouldered)
255-17	.15	1/2" spacer (shouldered)
258-1	.05	Dial cord spring
258-25	.05	Gear tension spring
259-1	.05	Large #6 solder lug
259-6	.05	Small #6 solder lug
259-10	.05	3/8" control solder lug
259-12	.05	1/4" solder lug
TERMINAL STRIPS-SOCKETS-PLUGS		
431-46	.15	2-lug terminal strip
431-10	.15	3-lug terminal strip
431-45	.15	6-lug terminal strip
431-49	.15	11-lug terminal strip
434-34	.15	7-pin tube socket
434-75	.35	9-pin tube socket
434-42	.15	Phono socket
434-88	.15	Pilot lamp socket
436-4	.40	Phone jack (Key)
438-4	.15	Phono plug
438-6	.50	Octal plug
440-1	.35	Octal plug cap

PART No.	PRICE Each	DESCRIPTION
WIRE		
340-2	.05/ft	Length #20 bare wire (small)
340-3	.05/ft	Length #16 bare wire (heavy)
343-5	.20/ft	Length coax cable (RG-62/U)
344-50	.05/ft	Length hookup wire
347-7	.15/ft	Length 4-conductor cable
METAL PARTS		
90-359	2.50	Cabinet
203-484	1.20	Front panel
203-254	1.65	Subpanel
205-312-1	1.45	Chassis
201-29-1	2.55	Chassis base
205-313	1.95	Bottom plate
205-314	1.05	Gear mounting plate
205-315-2	.45	Dial plate
204-135	.15	Angle bracket (small)
204-213	.40	Angle bracket (pointed)
204-215	.70	Dial pointer bracket (channel shaped)
204-423	.40	Variable capacitor bracket
ASSEMBLIES		
100-19	.35	Dial cord drum, small
100-165	.40	Dial cord drum, large
100-125	.60	Dial cylinder plug with bushing
100-132	.75	Dial cylinder support with two pulleys
100-200	.40	Dial cylinder shaft with pulley attached
100-201	1.65	Shaft with small gear
100-202	4.50	Shaft with large gear

PART No.	PRICE Each	DESCRIPTION
GEARS-SHAFTS-BUSHING-COUPLING-PULLEY		
451-12	1.05	Nylon gear
451-15	1.70	Brass gear
451-16	2.25	Anti-backlash gear
453-35	.25	4-3/8" shaft
453-78	.45	1-1/2" shaft
455-6	.15	Shaft bushing
456-7	.40	Shaft coupling
466-7	.15	Dial pulley (small)
MISCELLANEOUS		
73-4	.15	Rubber grommet
75-30	.15	Plastic strain relief
261-9	.05	Rubber foot
349-1	.05/ft	Length dial cord
446-61	2.95	Dial window
462-257	1.30	Large knob
462-122	.60	Small knob
463-15	.35	Dial pointer
464-19	5.00	Dial cylinder (plastic)
485-7	.25	Dial cylinder plug (1/4" center hole)
331-6	.25	Solder
	2.00	Manual (See front cover for part number.)

The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering from a Heathkit Electronic Center to cover local sales tax, postage, and handling. Outside the U.S.A. parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

EXPEDITED PARTS ORDER FORM
(FOR REPAIR PARTS ONLY)

PLEASE DO NOT WRITE IN THIS SPACE

(1) Give Part Numbers as they are in parts list.

(2) Include remittance or permission for C.O.D. shipment. ☐ CASH ☐ C.O.D.

(3) Use separate sheet of paper for all correspondence.

(4) Prices may change to reflect current manufacturing costs.

(5) Current **HEATH** account number **AA**

KIT MODEL _____

DATE OF PURCHASE _____

SERIES NUMBER _____

QTY.	PART NUMBER	DESCRIPTION	PRICE	TOTAL PRICE	MARK PROPER SPACE FOR WARRANTY PARTS ONLY 3 DAMAGED	2 DEFECTIVE	1 MISSING

HEATH COMPANY
BENTON HARBOR
MICHIGAN 49022
PHONE 616-983-7381

NAME _____
ADDRESS _____
CITY _____
STATE _____ ZIP _____

THIS FORM IS FOR U.S. CUSTOMERS ONLY. OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR.

CUT ALONG DOTTED LINE

EXPEDITED PARTS ORDER FORM
(FOR REPAIR PARTS ONLY)

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(1) Give Part Numbers as they are in parts list.

(2) Include remittance or permission for C.O.D. shipment. ☐ CASH ☐ C.O.D.

(3) Use separate sheet of paper for all correspondence.

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KIT MODEL _____

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SERIES NUMBER _____

QTY.	PART NUMBER	DESCRIPTION	PRICE	TOTAL PRICE	MARK PROPER SPACE FOR WARRANTY PARTS ONLY 3 DAMAGED	2 DEFECTIVE	1 MISSING

HEATH COMPANY
BENTON HARBOR
MICHIGAN 49022
PHONE 616-983-7381

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CUSTOMER SERVICE

REPLACEMENT PARTS

If you need a replacement part, please fill in the Parts Order Form that is furnished and mail it to the Heath Company. Or, if you write a letter, include the:

- **Part number** and **description** as shown in the **Parts List.**
- Model number and Series number from the blue and white label.
- Date of purchase.
- Nature of the defect.

Please do not return parts to the factory unless they are requested. Parts that are damaged through carelessness or misuse by the kit builder will not be replaced without cost, and will not be considered in warranty.

Parts are also available at the Heathkit Electronic Centers listed in your catalog. Be sure to provide the Heath part number. Bring in the original part when you request a warranty replacement from a Heathkit Electronic Center.

NOTE: Replacement parts are maintained specifically to repair Heathkit products. Parts sales for other reasons will be declined.

TECHNICAL CONSULTATION

Need help with your kit? . . . . Self-Service? . . . . Construction? . . . . Operation? . . . . Call or write for assistance. You'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek. . .please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

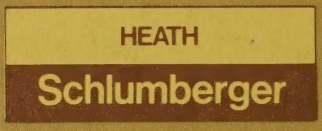
If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit C.O.D. for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022



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